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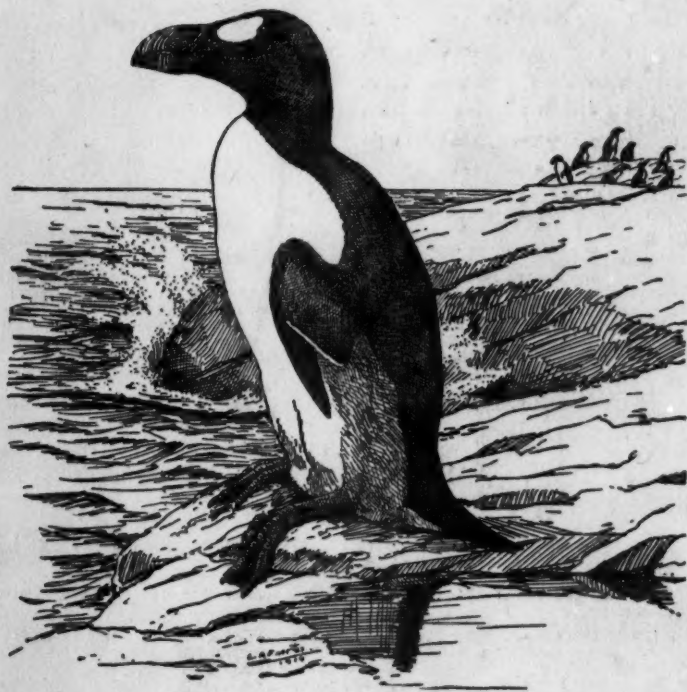
The Auk

A Quarterly Journal of Ornithology

Vol. XL

APRIL, 1923

No. 2



PUBLISHED BY

The American Ornithologists' Union

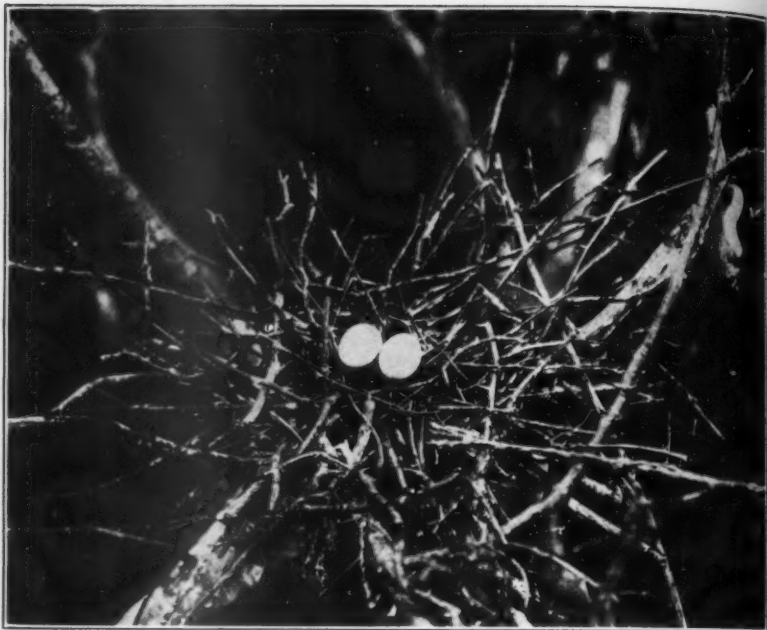
LANCASTER, PA.

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NESTS OF BLACK-CROWNED NIGHT HERON

1. Crude type of nest, 1905, H. K. Job.
2. Nest No. 19. A substantial type of nest, made of Pine, Bayberry and Beach Plum branches and lined with grass, Beach Grass roots and Pine Needles.

THE AUK:

A QUARTERLY JOURNAL OF

ORNITHOLOGY.

VOL. XL.

APRIL, 1923.

No. 2.

THE BLACK-CROWNED NIGHT HERON (NYCTICORAX NYCTICORAX NAEVIUS) OF SANDY NECK.

BY ALFRED O. GROSS.*

Plates V-XIV.

THE NEST.

THE typical nest of the Black-crowned Night Heron represents a poor type of architecture. Many of the structures are little more than crude, loosely constructed platforms of large coarse sticks which may be lined, usually scantily, with roots, twigs, grass, ferns or other similar materials. The nests are not well adapted for service in the tree tops where they are often exposed to buffeting winds. Some of the nests at Sandy Neck were so frail and insufficiently cupped that several eggs and many young were blown onto the ground during a severe storm on June 18, 1920. It is probable that the instincts of nest building have been handed down to the present day Herons from ancestors that built their nests on the ground or among the reeds and grasses of the marshes where this kind of nest serves all that is intended. Indeed, as has already been noted, many of the Black-crowned Night Herons, especially those in the middle west, still cling to what may be the more ancient habitat.

The composition of the nest somewhat depends on the available material accessible in the vicinity of the rookery. At Sandy Neck the foundations of the nests were constructed of coarse dead

*Concluded from page 30.

branches of cedar, oak and especially of pitch pine. Some of the latter were two to three centimeters in diameter and from 50 to 70 centimeters in length. Many of the nests on the east side of the rookery were built of dead densely branched stalks of bayberry and beach plum, shrubs which had been killed by the severe winter and subsequently blown into heaps among the dunes by the sand laden winds. Many of the stalks were large and cumbersome but they made very substantial foundations. A large percentage of the nests were lined in part or wholly with the long flexible roots of beach grass. It puzzled me to know how it were possible for the birds to secure some of the very long roots, some of which were more than a meter in length, until I chanced upon a score of adult Herons tugging at the roots which had been left unearthed in the wake of a traveling sand dune. The numerous foot prints in the sand evidenced that such places were the common source of their supply. The roots provided an unusual but admirable nesting material and some of the nests lined with them represented the finest types built by the Herons at Sandy Neck (Plate VII, figs. 1 and 2). In addition to the materials enumerated above there were variable quantities of wild rose, cat briar, slender weed and grass stalks, blades of marsh and beach grass and pine needles.

In some cases the birds used a last year's nest as a foundation and in several instances the alternate deposits of coarse and fine materials revealed that the structures were the accumulations of materials of two or more years. More frequently, however, the remains of the old nests are torn apart and new ones constructed in the same tree or in a site not far remote. During the month of July I saw Herons dismembering nests, which had recently been deserted by the young, in order to get materials to build a nest for a second brood. In one case I saw a Heron steal material from an occupied nest at a time when the owners were away at the fishing grounds.

At Whaleboat Island the foundations of most all of the nests were composed of dead limbs of spruce more or less interwoven with long stems of raspberry vines and briar. With but few exceptions the nests were lined with the stems of dead fern leaves which are abundant on all parts of the island. When I visited the

Whaleboat rookery in May 1921 every one of the nearly 100 nests examined was occupied, which goes to show that either the nests of the previous year are used or at least the materials are utilized in new construction work.

At the close of the nesting season the nests present an unsightly appearance usually being completely covered with filth and limy deposits. The excreta, because of their liquid nature, cannot be removed by the parent birds even though they desired to keep the nest clean. Under normal conditions there are but few regurgitations of indigestible matter for even the bones of the larger fish are dissolved by the acid secretions of the digestive tract. It is the bones of the animals eaten that contribute the calcium constituents of the excreta, which give not only the nests but also the trees and vegetation underneath the rookery a veritable whitewashed appearance.

Both the male and the female actively concern themselves in the work of building the nest which usually requires from two to five days, but, in the case of one nest, construction work and alterations were going on for a period of more than a week.

The following table contains the measurements of 10 representative Black-crowned Night Heron nests from the colony at Sandy Neck, Barnstable, Massachusetts.

MEASUREMENTS OF NESTS

Record Number of nest	Distance from the ground	Diameter outside	Diameter inside	Depth of cup	Depth of the entire nest
1	30 feet	55×60 cm.	24 cm.	.8 cm.	26 cm.
2	12	57×60	25	7.0	28
17	17	40×46	18	4.5	18
19	16	50×80	24	7.0	16
20	14	58×90	28	6.5	41
21	21	44×80	18	5.0	18
38	22	48×64	30	4.2	23
39	16	50×60	28	4.5	15
45	10	58×65	30	4.0	20
56	18	42×47	19	2.0	8

In the above table the measurements of the outside diameter include the extreme tips of materials comprising the nest. The

inside diameter is the approximate area of the cupped depression used by the nesting bird and young. The depth of the cup is the distance from a meter-stick resting on the top of the nest to the bottom of the interior of the cup. The entire depth is the distance from a meter-stick placed as indicated above to the lowest twigs on the exterior of the nest. Some of the newly constructed nests, as number 56 in the above table, were so thin and composed of such coarse sticks that the eggs were plainly visible when viewed from below (Plate V, fig. 1). Other nests as number 20 were the accumulation of materials of two or more years.

THE EGGS

The eggs of the Black-crowned Night Heron are variously described by different authors as clear blue,¹ pale bluish green,^{2,3} blue,⁴ bluish green to greenish yellow,⁵ pale greenish blue,⁶ pale dull blue,⁷ pale sea green color,⁸ pale green tinged with blue,⁹ and light pea-green.¹⁰ These few examples are I think sufficient to impress the reader with the importance of using some standard of color. The color of the Heron's egg is clear blue to one writer and pale sea green to another and the impression of each of these colors conveyed to the reader is necessarily a variable one unless there is some means of making a comparison with the same standard. At the present there is nothing better for this purpose than Ridgway's Standards of Color Nomenclature. The color of the majority of the eggs which I have examined approaches very nearly that represented by Ridgway as Glaucous-green. If the reader refers to this color as represented in Ridgway's color standards he will receive a fairly correct impression of the color of the Night Heron's freshly laid egg.

The eggs vary in number from one to five but sets containing six and even as many as eight have been reported. The latter

¹ Barrows, W. B., 1912, *Michigan Bird Life*, pp. 146-147.

² Reed, C. A., 1904, *North American Bird's Eggs*, pp. 98-99.

³ Macoun, J., 1900, *Catalogue of Canadian Birds*, p. 134.

⁴ Finley, W. L., 1907, *American Birds*, p. 226.

⁵ Hatch, P. L., 1892, *Birds of Minnesota*, pp. 95-96.

⁶ Butler, A. W., *Birds of Indiana*, p. 666.

⁷ Chapman, F. M., 1916, *Birds of Eastern North America*, p. 228.

⁸ Coues, E., 1896, *Key to N. A. Birds*, p. 663.

⁹ Chamberlain, M., *Nuttall's Ornithology*, p. 91.

¹⁰ Samuels, E. A., 1867, *Ornithology and Oölogy of N. England*, p. 411.



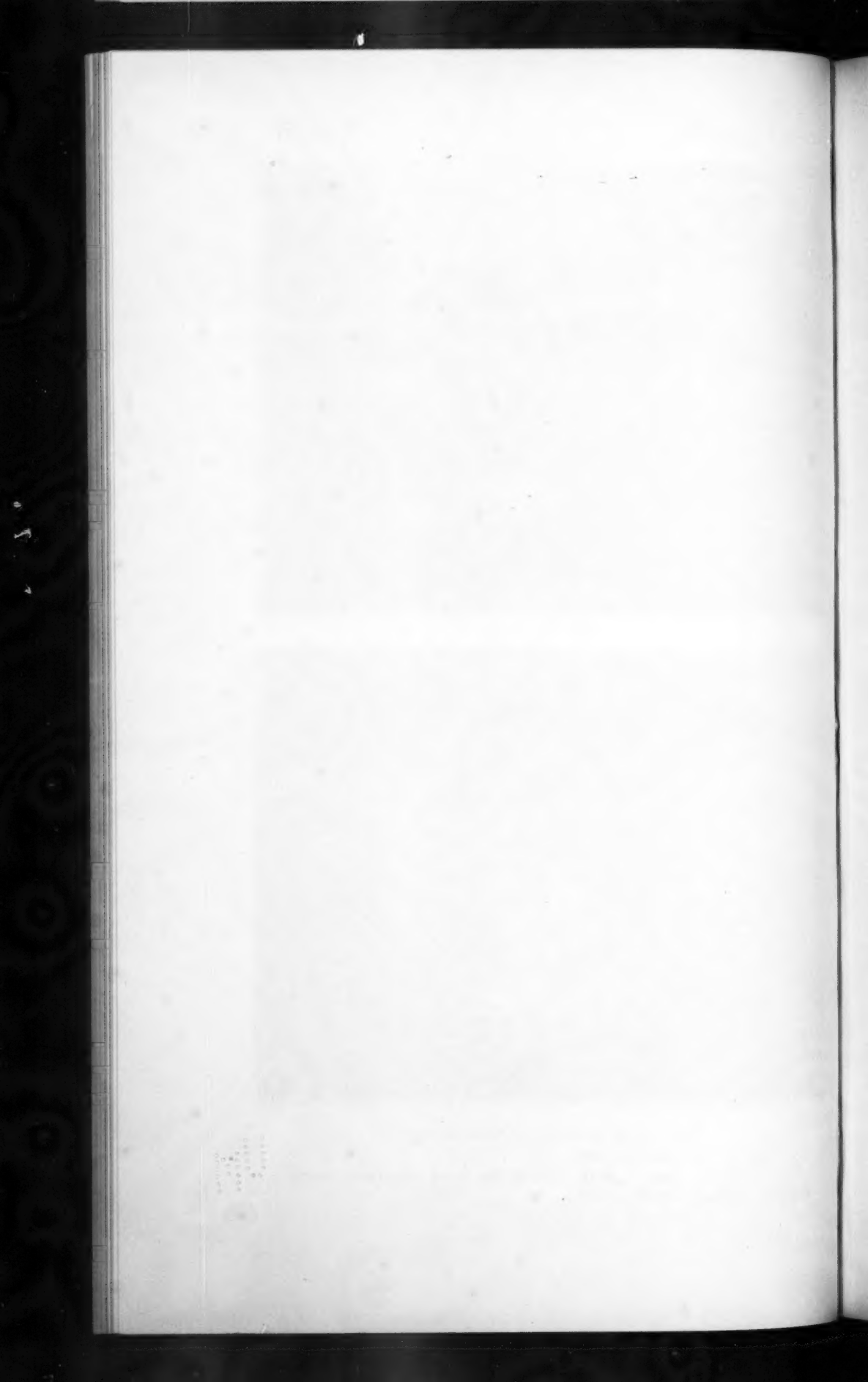
1. Black-crowned Night Herons on nests in oaks and maples, 1905.
H. K. Job.
2. Bird just settling on Nest in Pitch pine, 25 ft. up. Taken with
camera concealed in neighboring tree.

1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860



NESTS OF BLACK-CROWNED NIGHT HERON.

1. Nest No. 21. June 26, 1920.
2. Nest No. 3. June 19, 1920. One of the finest structures among hundreds studied; in pine, 12 feet up.



numbers are of course very extreme and, in all probability represent the eggs of more than one female. I have had nests which contained only one egg under continual observation so apparently one egg may represent a complete set. The average number of eggs in complete sets is greater at the beginning (first nest) than it is at the end of the nesting season; a correlation which has been noted in the case of many other species of birds.

The weights and measurements of ten random sets of eggs which were complete as far as could be determined are as follows,—

Number of nest	Weight in grams	Long diameter in centimeters	Short diameter in centimeters
1	33.7	5.30	4.85
	34.8	5.55	4.76
3	31.0	5.22	3.50
	32.0	5.10	3.60
	32.5	5.25	3.60
11	33.8	5.10	3.50
	34.0	4.91	3.72
	34.9	5.05	3.70
13	32.5	4.90	3.51
	32.8	5.40	3.49
15	31.9	4.95	3.68
	29.3	4.80	3.55
	29.9	4.91	3.62
16	34.5	5.80	3.60
	36.9	5.85	3.63
	33.7	5.10	3.82
	33.0	5.62	3.65
17	33.1	4.95	3.62
	34.4	5.11	3.70
	32.2	4.90	3.72
	33.8	5.31	3.65
19	37.0	5.30	3.75
	31.8	5.02	3.58
	36.2	5.10	3.84
	32.3	4.95	3.61
	33.1	5.00	3.58

Number of nest	Weight in grams	Long diameter in centimeters	Short diameter in centimeters
21	39.5	5.10	3.46
	39.0	5.21	3.28
	39.3	4.86	3.49
	35.5	4.72	3.24
54	29.8	4.65	3.40
	32.2	4.95	3.62
	33.5	4.60	3.75

The average weight and measurements of one hundred eggs are as follows:

Weight 33.92 grams; long diameter 5.14 cm.; short diameter 3.67 cm.

All the above measurements were made in the field and the eggs were returned to the nests as soon as the measurements were completed. No attempts were made to weigh the empty shells but the following determinations made by Lt. G. Ralph Meyer, Fort McKinley, Maine¹, are of interest.

"Only averages are given for each set or series of eggs.

		Average Weight						Cubic Contents
		Full			Empty			
Set of 3	1 oz.	2 dr.	1 scr.	4 gr.	2 scr.	15 gr.	26 c.c.	
"	1 "	1 "	2 "	0 "	2 "	9 "	24 "	
"	1 "	2 "	1 "	6 "	2 "	9 "	25 "	
"	1 "	1 "	1 "	19 "	2 "	9 "	24 "	

INCUBATION

The first egg is laid soon after the nest is completed. In the case of one nest under daily observation the first egg was laid two days after all construction work had ceased and seven days after the first sticks forming the foundation were put in place. It seems to be customary among Black-crowned Night Herons to start incubation at the time of the laying of the first egg though it may be several days or even a week before the set of eggs is complete. This accounts for the irregular and sometimes long intervals of time which may elapse between the hatching of the different eggs in any one nest and also the unequal age and size of the young which in some instances is very apparent even to

¹ Meyer, Lt. G. Ralph, Auk, 1916, vol. 33, p. 82.

the casual observer. There was a difference of six days in the hatching period of the young in one nest under daily observation. I have seen broods in which there seemed to be even more marked difference in size but in these cases where no hatching records were made it is possible unequal feeding may have been an important factor in producing the marked inequalities in size and weight.

The time required for incubation as ascertained from observations made in the field in which the laying and hatching times of individual eggs were known varied from 24 to 26 days. Both sexes take an active part in incubation. I have frequently had nests under observation when the shift from one sex to the other took place. The instinct for incubation seems strongly developed in these birds. From my blind I could see the brooding bird was very loath to give up the place on the nest and the oncoming bird was just as determined to take a turn. Sometimes the shift involved a domestic quarrel in which there resulted a vigorous interchange of sharp, rebuffing shrieks accompanied by violent thrusts. I never observed a bird deliver food to its mate but the sharing of the responsibilities in brooding the eggs gave each an opportunity to secure the necessary amount of food and relaxation.

HATCHING

The emergence of the chick is a somewhat prolonged process, at least it was in the few cases in which I have had a chance to make observations. In one instance the embryo in an egg pipped at noon, June 19, was still imprisoned in the shell at eight o'clock the next morning (Plate VIII, fig. 1). At noon June 20, portions of the calcareous shell were broken away and the shell membrane was partially ruptured (fig. 2). At four P. M. the head was unfolded (fig. 3) and twenty minutes later the chick was completely free from the egg (fig. 4). In about two hours after hatching the natal down of the little Heron was dry enough to form a substantial protective covering (fig. 5). The eyes were open from the beginning and on the following day the young bird was very active and able to sit up in an erect position (fig. 6). The little Heron uttered a faint plaintive "pip, pip, pip," when it was hungry and also at times when it was left alone at the nest after the adults were frightened by my entrance into the blind.

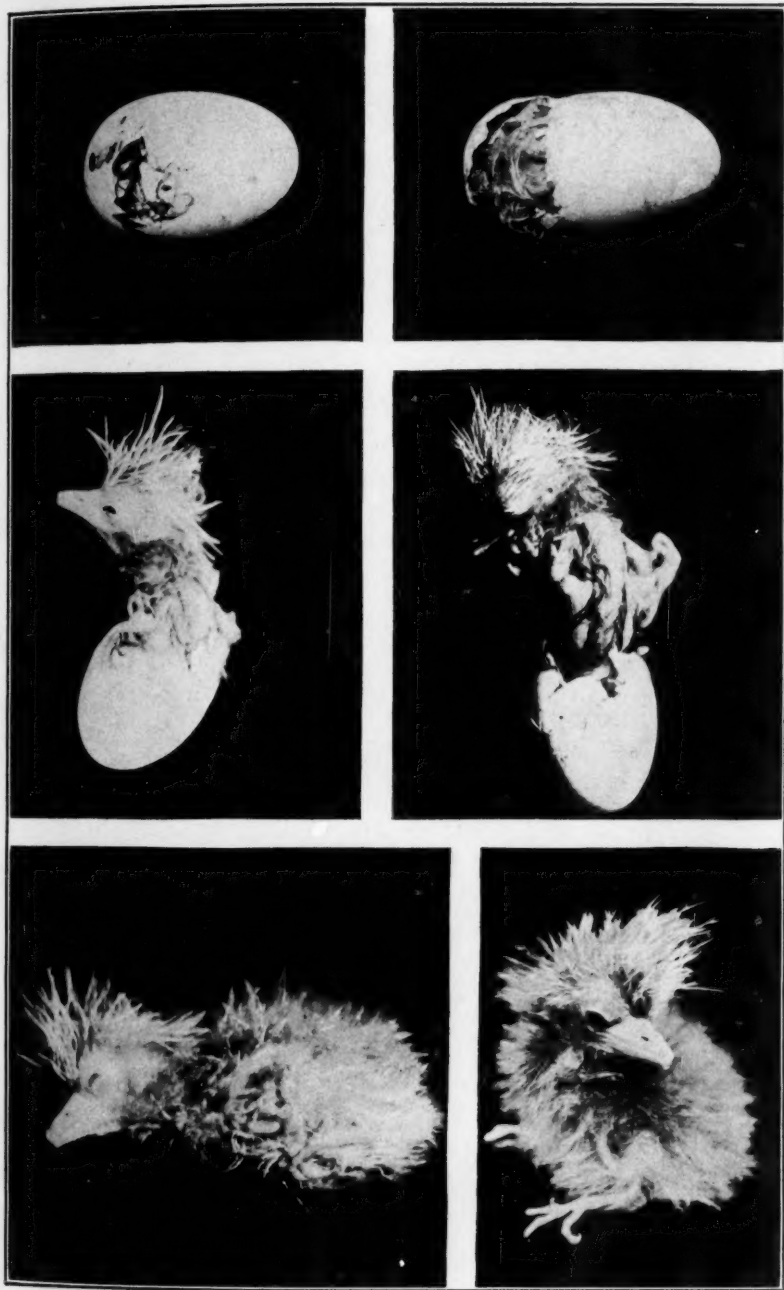
NATAL PLUMAGE

The natal down of the head, neck and dorsal portions of the body of a day old chick varies from a dark mouse gray to a deep neutral gray. The outer three fourths of the crown filaments are white. These white tips are very conspicuous in the freshly hatched chick but after a few days' exposure to the sun and air they are much less sharply differentiated. The down of the ventral tracts varies from pallid neutral gray on the lower belly to gray on the breast and dark mouse gray on the neck. The down of the crown is much longer than that of the body so that a conspicuous crest is formed. The longest filaments of down on the crown in one day old Herons are 2.8 to 3.0 centimeters long while those of the back average only 1.5 and seldom exceeded 1.7 centimeters in length. The down of a chick when dry, completely conceals the wings and aptera and even the feet and bill do not appear conspicuous in the downy contour.

At five days of age the down of the dorsal parts of the bird fades to a mouse gray; the ventral down seems to have acquired a pale gull gray tinge, due perhaps to the constant contact with the filth stained twigs of the nest. The fading out process seems to be more marked in the 10 day old bird which, with the numerous papillae of the juvenal plumage appearing through the skin, is any thing but a handsome creature. The transition from the natal to the juvenal plumage is not abrupt for vestiges of the natal down remain even after the birds leave the nest. The post-natal molt is not completed until the bird is five to six weeks old, an age in which the feathers of the juvenal plumage have made considerable progress.

JUVENAL PLUMAGE

The first papillae of the juvenal plumage make their appearance in the region of the flanks and scapulars on the fifth or sixth day after hatching. These are closely followed by the papillae of the wing coverts and of the ventral tracts. By the seventh day the papillae of the alar tracts, (primaries and secondaries), show through the integument but those of the rectrices (tail) do not appear until the bird is about ten days old. At this age the tips



HATCHING OF BLACK-CROWNED NIGHT HERON.

1. A pipped egg, July 20, 8 A.M.
2. Same egg at noon.
3. Same at 4 P.M.
4. Same at 4:10 P.M.
5. Chick at 6 P.M.
6. Chick one day old.

1000



YOUNG BLACK-CROWNED NIGHT HERONS.

1. Bird six days old. Fellows removed from nest.
2. Ten days old.
3. Twelve days old.

[illegible]

of the feathers of the scapular region and flanks are unsheathed. The primaries and secondaries present their unsheathed tips about the fifteenth day, but no unsheathing takes place in the rectrices until the bird is about three weeks old. The unsheathing when once started proceeds rapidly and by the time the bird is four weeks old it has the smooth contour possessed by an adult bird. The complete growth of the juvenal plumage is not accomplished, however, until the bird is about fifty days old.

The changes in the coloration of the iris, the exposed parts such as the bill and feet and the general integument are so marked and so rapid that it has seemed best to indicate them by means of a special table. The remarkable changes in the color of the iris are so striking and so interesting from a histological and physiological point of view that they have provided material for a separate paper. The names of colors, used in this table as well as in all descriptions of birds in this paper, are taken from Ridgway's 'Color Standards.'¹ Great care has been exercised in matching the colors, and in most every case the color given is an approximation of the average found in several individuals known to be of the same age. The colors in this table, especially those of the iris and other parts subject to change soon after death, were determined in the field or at my camp from living birds or from freshly killed specimens in which the colors had undergone no change.

IRIS.

1-day old. Grayish olive	40 days. Deep chrome.
2-3 days. Reed yellow to olive yellow.	50 days. Pinard yellow.
4-5 days. Chalcodony yellow.	1 year (2nd year plumage). Orange chrome.
10 days. Barium yellow.	2 years (3rd year plumage). Flame scarlet.
20-25 days. Lemon yellow.	Adult. Scarlet to scarlet red.
30 days. Strontian yellow.	

UPPER DORSAL MANDIBLE.

1 day old. Light drab, tinged with dark grayish olive at tip.	4-5 days. Marguerite yellow to yellowish olive.
2-3 days. Pale smoke gray, tinged with olivaceous black at tip.	10 days. Ivory yellow, tinged with dark neutral gray at base.

¹ Ridgway, Robert, 1912, Color Standards and Color Nomenclature.

20-25 days. Olive-buff tinged with vinaceous-buff.

30 days. Vinaceous-buff, shading to olive buff on sides and mouse gray at base.

40 days. Olivaceous black shading to chartreuse yellow on sides.

50 days. Black, shading to dark ivory yellow on sides.

1 year. Black shading to light greenish olive on sides.

2 years. Black.

Adult. Black.

LOWER MANDIBLE.

1 day old. Light drab with grayish olive on edges near tip.

2-3 days. Olive-buff tipped with darker.

4-5 days. Olive gray tipped with darker.

10 days. Horn color to pale drab gray.

20-25 days. Olive buff tinged with vinaceous buff.

30 days. Pale olive buff shading to colonial buff at tip.

40 days. Same.

50 days. Horn color.

1 year. Light yellowish olive with shades of brown and black; tip horn color.

2 years. Black.

Adult. Black.

CLAWS.

1 day old. Gray to white, color uniform.

2-3 days. Gray, tips white.

4-5 days. Buff tinged with white.

10 days. Same.

20-25 days. Same.

30 days. Pale mouse gray; tips paler.

50 days. Dark olive gray.

1 year. Dark olive gray, horn color darker on the lateral portions of the base of the claws.

2 years. Similar.

Adult. Similar.

TARSUS AND TOES (Upper Surface).

1 day old. Light cinnamon drab to brownish vinaceous on toes.

2-3 days. Light olive gray.

4-5 days. Yellowish olive.

10 days. Deep olive gray.

20-25 days. Pale turtle to light turtle green.

30 days. Light turtle green.

40 days. Light grape green.

50 days. Light turtle green above heel, shading through tarsus to tea green on toes.

1 year. Light grape green.

2 years. Barium yellow.

Adult. Sea-foam yellow on tarsus to naphthalene yellow on toes.

TARSUS AND TOES (Lower Surface).

1 day old. Light cinnamon drab.

2-3 days. Colonial buff.

4-5 days. Reed yellow.

10 days. Corydalis green.

- | | |
|---|-----------------------------|
| 20-25 days. Chartreuse yellow. | 50 days. Tarsus light grape |
| 30 days. Same. | green, toes as in last. |
| 40 days. Tarsus chartreuse yellow, toes pale chalcedony yellow. | 1 year. Amber yellow. |
| | 2 years. Barium yellow. |
| | Adult. Primrose yellow. |

NAKED SKIN.

- | | |
|--|---|
| 1 day old. Pinkish buff to light ochraceous salmon. | 40 days. Lores olivaceous black, skin about eyes water green. |
| 2-3 days. Vetiver green about eye; throat pale green-yellow; body light yellowish olive. | 50 days. Lores deep lichen green shading to black of bill, skin about eyes light dull green-yellow. |
| 4-5 days. Vetiver green about eye; throat and body reed yellow to yellowish olive. | 1 year. Lores deep grayish blue green with faint purple reflections. |
| 10 days. Deep olive gray, skin under wings glass green. | 2 years. Lores and naked skin about eyes tea green to grayish olive. |
| 30 days. Lores and region around the eyes, pallid mouse gray. | Adult. Similar. |

EYE LIDS.

- | | |
|------------------------------|-----------------------------|
| 1 day old. Olivaceous black. | 40 days. Same. |
| 2-3 days. Same. | 50 days. Same. |
| 4-5 days. Black. | 1 year. Grayish blue green. |
| 10 days. Same. | 2 years. Olivaceous black. |
| 20-25 days. Same. | Adult. Same. |
| 30 days. Same. | |

The following description of the juvenal plumage is based upon a bird 28 days old. This age is representative of a plumage in which the unsheathing is only partially completed but at this stage of development the feathers are brighter and richer in color than they are in juvenals in which the plumage has been faded by several months exposure to the sun and air.

Crown and back glossy olivaceous black neck *Chaetura* drab, the feathers with median streaks of varying shades of buff. The median streaks in the feathers of the back are of a richer and deeper color approaching very nearly that of cinnamon. The apices of the crown feathers have filaments of natal down but the remainder of the juvenal plumage is entirely free of vestiges of this first plumage. The throat with an elongated median patch of white tinged with ivory yellow which extends posteriorly

to the neck. Sides of chin, head and neck streaked with *Chaetura* drab, fuscous-black and various shades of buff. Feathers of the breast, upper belly and flanks white tinged with light cartridge buff, each feather with broad lateral streaks or bands of light fuscous or hair brown. Lower belly and crissum white and not streaked. Tail feathers deep mouse gray, primaries and secondaries fuscous black, tipped with white and with outer veins tinged with cinnamon. The white tips of the secondaries are much reduced and the outer veins have less of the cinnamon than have the primaries. The feathers comprising the wing coverts and tertials have large conspicuous terminal spots of white or light buff.

So little is known concerning the growth of young birds that it seemed well worth while to spend considerable time in making a series of careful comparative measurements and weights of the growing young Herons through the natal and juvenal stages. For this purpose twelve Herons of different ages representing four different broods were selected soon after I arrived at the Sandy Neck rookery in June, 1920. The older birds were kept in poultry coops at my camp as soon as they were able to fly, otherwise I would not have been able to secure measurements of advanced stages of growth. It is impracticable to present all of the numerous measurements in a paper of this kind but those of two birds whose ages overlap at the twenty-eighth day of growth will serve as a representative series. It is necessary to use the measurements of two birds because the time at my disposal was not sufficient to follow the growth to completion on a single individual. In the following table the measurements of the various parts of the body and of certain feathers are given. In the case of feathers of the scapular region, wing coverts etc. the measurement given is the average of two or three of the longest feathers of the region. The progress of unsheathing is indicated by the numbers in parentheses beneath those of the feather measurements. This table will be of value to the ornithologist in aiding him to ascertain the approximate age of immature Night Herons. To be sure there is a variation in the measurements of different individuals but if all the measurements and changes in coloration are considered one can determine the age of even the older young with an error of not more than two or three days.



YOUNG BLACK-CROWNED NIGHT HERONS.

1. Photographed July 11, 1920. The two playing are nine days old. Two of the eggs pipped, July 1, and hatched July 2. Third egg, pipped July 3, hatched July 4.
2. The daily routine of weighing.



YOUNG BLACK-CROWNED NIGHT HERONS.

1. Fifteen days old.

2. Eighteen days old.

MEASUREMENTS OF YOUNG NIGHT HERONS IN CENTIMETERS. (FIGURES IN PARENTHESES INDICATE AMOUNT OF UNSHEATHING OF FEATHER.)

	1	2	3	4	5	6	7	8	10	12	15	18	20	22	24	26	28	31	34	36	40	44	7	7
Age in days	10.2	12.5	13.3	14.4	17.1	18.5	21.6	23.4	27.2	31.4	36.2	40.5	42.8	45.8	46.5	47.8	49.5	52.1	55.1	56.6	58.6	60.1	61.5	62.1
Length	1.46	1.6	1.6	1.8	1.8	2.3	2.4	2.7	3.0	3.6	4.1	4.5	4.9	5.2	5.4	5.4	5.5	5.6	5.8	5.9	6.0	6.1	6.1	6.8
Bill	2.3	2.4	2.7	3.1	3.8	4.1	4.3	4.5	4.8	5.9	6.8	7.2	7.9	8.3	8.5	8.7	8.7	8.8	9.5	9.6	9.8	10.1	10.2	10.3
Gape	2.0	2.1	2.2	2.3	2.5	2.9	3.3	3.5	4.2	5.9	6.7	7.1	7.4	7.6	7.8	8.1	8.1	8.3	8.6	8.7	8.9	8.9	8.9	9.1
Eye to tip of bill	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tail	1.6	1.7	1.8	1.9	2.1	2.4	2.9	3.1	4.6	6.2	8.3	11.5	13.4	15.4	16.2	17.9	18.8	20.5	22.5	23.3	24.6	26.6	30.8	30.5
Wing	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sixth Primary	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sixth Secondary	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Extent of Tarsus with 3rd toe	9.5	10.5	11.0	12.7	14.4	16.0	19.2	21.5	25.2	33.5	45.9	57.0	62.3	70.0	74.9	79.2	82.6	89.4	95.4	99.5	103.2	107.8	111.2	113.4
Toe-toe	3.5	3.9	4.2	4.5	5.4	6.2	7.1	8.5	9.8	11.9	12.6	13.8	14.4	15.1	15.4	16.1	16.5	17.3	18.2	18.3	18.4	18.5	18.0	18.7
Front middle or 3rd toe	2.9	3.1	3.5	3.9	4.6	4.9	6.5	7.6	8.5	11.1	12.9	13.1	13.6	13.8	13.8	13.8	13.9	13.9	14.5	14.5	14.6	14.7	12.5	14.0
Third toe nail	1.4	1.6	1.7	1.9	2.3	2.6	3.7	3.9	4.6	6.4	7.1	7.6	7.9	8.2	8.4	8.6	8.6	8.6	8.8	8.8	8.8	8.8	8.8	8.4
Hind or first toe	.4	.42	.5	.55	.58	.58	.70	.80	.70	.75	.80	.90	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.1	1.2
Hind toe nail	1.1	1.3	1.4	1.6	1.8	2.2	2.3	2.9	3.2	3.8	4.4	4.5	4.6	4.7	4.7	4.7	4.7	4.8	4.8	4.8	4.8	4.8	4.7	5.1
Tertials	.40	.42	.55	.55	.56	.58	.70	.80	.90	1.1	1.2	1.2	1.4	1.5	1.5	1.6	1.6	1.6	1.8	1.8	1.8	1.8	1.5	1.7
Wing coverts	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Flanks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ventral tracts	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Weight (grams)	24.2	34.0	53.5	67.0	93.5	105.5	157.0	185.0	249.0	349.8	436.0	456.0	515.0	519.5	510.0	535.0	598.0	580.0	612.0	601.0	797.0	935.0	883.0	758.0

Measurements not made.

* Complete.

During the month of August, 1920, six Herons in the juvenal plumage were taken from the rookery at Sandy Neck and placed in the aviary at Franklin Park, Boston, in order to make further observations on molting and plumage changes. I am greatly indebted to Mr. George F. Morse, Jr., former director of the Zoological Garden, for hearty cooperation in this matter. Unfortunately, however, all of the birds died from the effects of fighting or other causes before any molting or plumage changes took place. One was injured and died soon after arriving at the park. Four of the birds died in December but one lived until February twenty-third, just before the time we expected the post-juvenal molt to take place. These birds are of interest because they represent the completely developed juvenal plumage and because they provide evidence that there is no post-juvenal molt occurring soon after the close of the breeding season such as is characteristic of the passerine birds. The entire plumage of the Herons which died in December and of the Heron which lived until the last week of February is in the juvenal stage. No molting according to Mr. Morse had taken place. In the following table are the measurements of three of the birds kept at the Park until the dates as indicated.

Date.....	December 28, 1920	December 29, 1920	February 23, 1921
Length (centimeters)....	58.2	59.8	60.2
Bill.....	7.2	7.3	7.8
Gape.....	9.5	9.8	10.5
Eye to tip of bill.....	8.9	9.1	9.4
Tail.....	10.9	11.6	11.4
Wing.....	28.1	30.9	31.3
Sixth Primary.....	18.1	19.8	20.5
Sixth Secondary.....	16.6	17.4	17.9
Extent.....	108.5	113.1	111.5
Tarsus with third toe....	16.1	17.0	16.1
Toe-toe.....	12.8	13.7	12.9
Front middle or third toe.	7.5	7.7	7.9
Third toe nail.....	1.2	1.2	1.4
Hind or first toe.....	4.4	5.1	4.6
First toe nail.....	1.6	1.8	1.8
Tertials.....	16.1	16.6	17.5
Flanks.....	7.5	7.6	7.7
Ventral tracts.....	7.0	7.5	7.5
Weight (grams).....	1010.00	1113.50	9864.00

The general impression one gains after a superficial comparison of these mid-winter birds with the juvenals collected during the breeding season is that the plumage of the older birds is decidedly paler, indeed so much so that it seems like a new plumage. This paler condition is due as far as I can determine to two causes. First there is a fading of the plumage involving chiefly the buff and cinnamon streaking of the general plumage but especially that of the back; secondly all of the feathers have a chalky or grayish appearance due to a whitish powdery substance produced by the powder down tracts.

POWDER DOWN TRACTS

The development of the powder down tracts, areas of modified and highly specialized downy feathers, peculiar to the Herons and a limited number of groups of birds, is of interest. In birds of the natal plumage the areas of skin destined to give rise to powder down tracts are void of natal down. The powder down areas become differentiated from the general integument in chicks about ten days old, and in twelve day old birds the minute papillae of the dorsal tracts show through. The papillae of the ventral powder down tracts make their appearance a few days later. At three weeks of age the powder down tracts are a dense mat of developing papillae, but none are unsheathed at this age. In juvenals four weeks old the tracts are well advanced and the tips of some of the papillae are unsheathed. In birds 50 days old the powder down tracts have very much the appearance of the tracts in the adults. Thus far I have not substantiated the statements frequently made that these tracts are phosphorescent organs, nor have I been able to find any reliable observer who has seen light produced by these patches of downy feathers. Some of the fishermen along the Cape relate startling stories of how the Herons produce a luminous glow in order to attract fish and other prey at night but after studying the birds confined in cages and others at their feeding grounds at night I am inclined to believe that the phosphorescence is a product of the imagination. The theory advanced by some ornithologists that the oily particles freed from these tracts fall on the surface of the water and thus lure prey to the birds has not been proven. Experiments which the

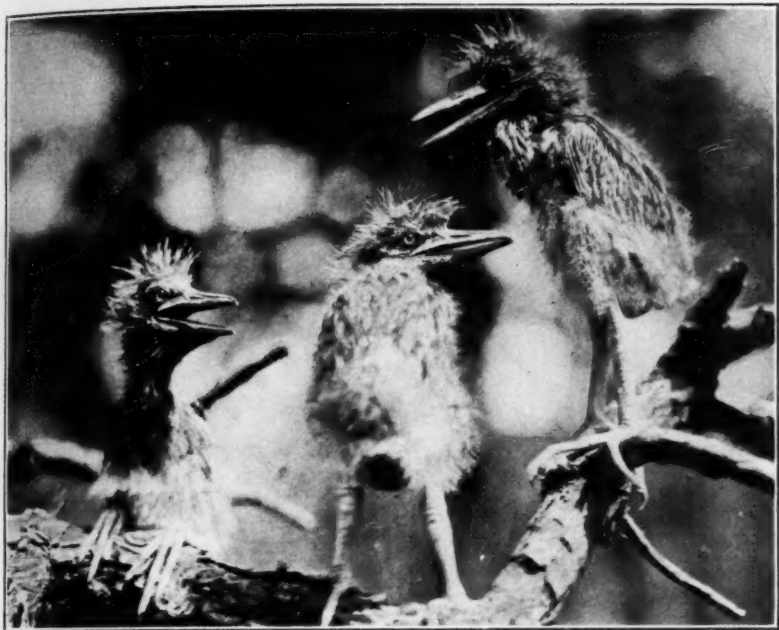
author conducted at Sandy Neck in attempts to attract aquatic animals with these particles were negative in character.

Dr. Alexander Wetmore¹ has shown very conclusively by his detailed observations that Herons, including the Black-crowned Night Heron, utilize the greasy powdery substance given off by the powder down tracts to dress and oil the contour feathers. He has correlated the time of the development of these tracts with the appearance of the contour feathers and he observed that the uropygial glands were relatively undeveloped in the young Herons at the time the powder down tracts became functional. My own observations confirm Dr. Wetmore's statements concerning the function of the powder down tracts. His further suggestion of the hypothetical origin of the uropygial glands through the amalgamation of a number of separate tubes opening separately is interesting.

In addition to the birds seen and studied at Sandy Neck the following series of skins representing the juvenal plumage were examined.

Number	Date	Sex	Locality	Collection
236-8	June 30, 1920	male	Barnstable, Mass.	Bowdoin College
10791	July 11, 1879	"	Marshpee, Mass.	M.C.Z.
3946	" 18, 1871	"	Cambridge, Mass.	Wm. Brewster
3945	August 4, 1875	female	" "	" "
10789	" 8, 1880	"	Wayland, Mass.	M.C.Z.
A513	" 13, 1920	male	Whalebaot Island, Maine	Bowdoin College
A516	" 16, "	?	Maquoit Bay, Maine	Bowdoin College
1640	" 19, 1894	female?	Chateaugay Lake, N. Y.	M.C.Z.
10188	" 20, 1879	female	Rye Beach, New Hampshire	Wm. Brewster
60518	" 24, 1912	male	Rowley, Mass.	M.C.Z.
16012	September 11, 1871	?	Ogden, Utah	"
10790	October 1, 1882	female	Wareham, Mass.	Bangs
29275	" 29, 1886	"	Tarpon Springs, Florida	Wm. Brewster
20842	December 23, 1907	"	Bolson, Costa Rica	Bangs

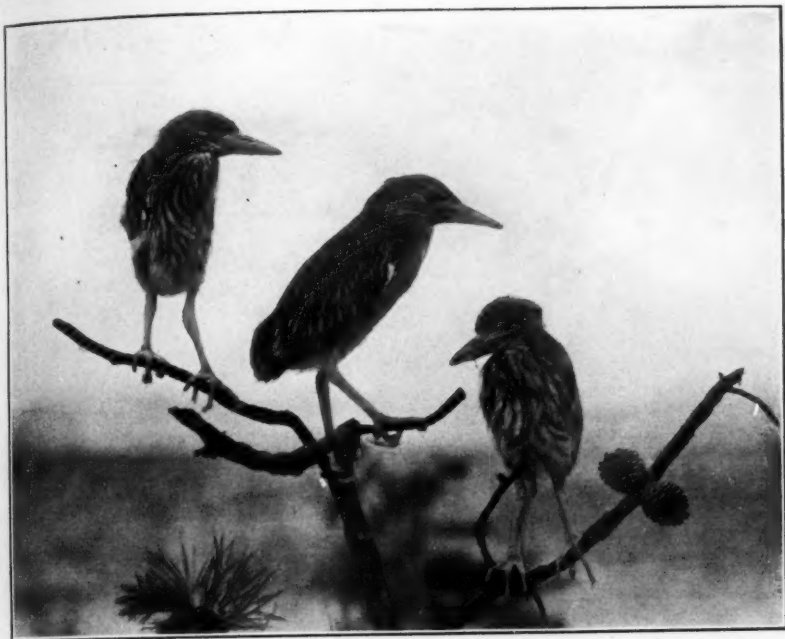
¹ Wetmore, Alexander, 1920, The Function of Powder Downs in Herons, *Condor*, vol. 21, pp. 168-170.



YOUNG BLACK-CROWNED NIGHT HERONS.

1. Seventeen and eighteen days old.
2. Twenty and Twenty-one days old.

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YOUNG BLACK-CROWNED NIGHT HERONS.

1. Birds of two different broods. Left to right, 24, 32 and 22 days old.
2. Twenty-two days old.
3. Twenty-six days old. A bird that had not been handled regularly and hence exhibited fear, such specimens as a control showed that the handling in no way checked development.



YOUNG BLACK-CROWNED NIGHT HERONS.

1. Bird in juvenal plumage, 44 days old.
2. Birds in juvenal plumage, about 36 days old.

Case No.	Case Name	Case Address	Case Phone	Case Email	Case Date	Case Time	Case Status	Case Comment
1	John Doe	123 Main St, New York, NY 10001	212-555-1234	john.doe@example.com	2023-10-26	10:30	Completed	Client satisfied with service.
2	Jane Smith	456 Elm St, Los Angeles, CA 90001	310-555-5678	jane.smith@example.com	2023-10-27	11:00	In Progress	Waiting for client feedback.
3	Michael Johnson	789 Oak St, Chicago, IL 60601	312-555-9012	michael.johnson@example.com	2023-10-28	14:00	On Hold	Client on vacation, rescheduling.
4	Sarah Williams	101 Pine St, San Francisco, CA 94101	415-555-3456	sarah.williams@example.com	2023-10-29	09:00	Completed	Project completed successfully.
5	David Brown	202 Cedar St, Austin, TX 78701	512-555-7890	david.brown@example.com	2023-10-30	13:00	Pending	Awaiting client decision.
6	Emily Davis	303 Maple St, Boston, MA 02101	617-555-2345	emily.davis@example.com	2023-10-31	10:00	Completed	Final review and sign-off.
7	Robert Miller	404 Birch St, Seattle, WA 98101	206-555-6789	robert.miller@example.com	2023-11-01	15:00	In Progress	Implementing new features.
8	Lisa Anderson	505 Spruce St, Denver, CO 80201	303-555-0123	lisa.anderson@example.com	2023-11-02	11:30	On Hold	Client needs more time to review.
9	James Wilson	606 Ash St, Portland, OR 97201	503-555-4567	james.wilson@example.com	2023-11-03	08:00	Completed	Client praised the team's effort.
10	Amanda Taylor	707 Hickory St, San Diego, CA 92101	619-555-8901	amanda.taylor@example.com	2023-11-04	12:00	Pending	Waiting for client approval.
11	Christopher Lee	808 Walnut St, Phoenix, AZ 85001	602-555-2345	christopher.lee@example.com	2023-11-05	16:00	In Progress	Developing new marketing strategy.
12	Nicole White	909 Cherry St, Dallas, TX 75201	214-555-6789	nicole.white@example.com	2023-11-06	09:30	On Hold	Client on business trip, delayed.
13	Kevin Green	1010 Elm St, Houston, TX 77001	281-555-0123	kevin.green@example.com	2023-11-07	13:30	Completed	Project wrapped up on time.
14	Michelle Black	1111 Oak St, San Jose, CA 95101	408-555-4567	Michelle.Black@example.com	2023-11-08	10:45	Pending	Awaiting client response.
15	Andrew Gray	1212 Pine St, San Antonio, TX 78201	210-555-8901	andrew.gray@example.com	2023-11-09	14:15	In Progress	Reviewing client requirements.
16	Stephanie King	1313 Cedar St, Fort Worth, TX 76101	817-555-2345	stephanie.king@example.com	2023-11-10	11:15	On Hold	Client needs more information.
17	Brandon Hall	1414 Birch St, San Diego, CA 92101	619-555-6789	brandon.hall@example.com	2023-11-11	08:45	Completed	Client very happy with results.
18	Karen Young	1515 Spruce St, Austin, TX 78701	512-555-0123	karen.young@example.com	2023-11-12	12:45	Pending	Waiting for client feedback.
19	Gregory Scott	1616 Ash St, Dallas, TX 75201	214-555-4567	gregory.scott@example.com	2023-11-13	15:45	In Progress	Implementing client suggestions.
20	Heather Adams	1717 Hickory St, Houston, TX 77001	281-555-8901	heather.adams@example.com	2023-11-14	09:15	On Hold	Client on leave, rescheduling.
21	Timothy Baker	1818 Walnut St, San Jose, CA 95101	408-555-2345	timothy.baker@example.com	2023-11-15	13:15	Completed	Project completed ahead of schedule.
22	Christina Clark	1919 Cherry St, Phoenix, AZ 85001	602-555-6789	christina.clark@example.com	2023-11-16	10:15	Pending	Awaiting client decision.
23	Jonathan Lewis	2020 Elm St, San Antonio, TX 78201	210-555-0123	jonathan.lewis@example.com	2023-11-17	14:15	In Progress	Developing new product features.
24	Kimberly Walker	2121 Oak St, Fort Worth, TX 76101	817-555-4567	kimberly.walker@example.com	2023-11-18	11:15	On Hold	Client needs more time to review.
25	Christopher Hall	2222 Pine St, San Diego, CA 92101	619-555-8901	christopher.hall@example.com	2023-11-19	08:15	Completed	Client praised the team's effort.
26	Michelle King	2323 Cedar St, Austin, TX 78701	512-555-2345	Michelle.King@example.com	2023-11-20	12:15	Pending	Waiting for client feedback.
27	Andrew Young	2424 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-11-21	15:15	In Progress	Implementing client suggestions.
28	Stephanie Adams	2525 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2023-11-22	09:15	On Hold	Client on leave, rescheduling.
29	Brandon Baker	2626 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2023-11-23	13:15	Completed	Project completed ahead of schedule.
30	Karen Clark	2727 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2023-11-24	10:15	Pending	Awaiting client decision.
31	Gregory Lewis	2828 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2023-11-25	14:15	In Progress	Developing new product features.
32	Heather Walker	2929 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2023-11-26	11:15	On Hold	Client needs more time to review.
33	Timothy Hall	3030 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2023-11-27	08:15	Completed	Client praised the team's effort.
34	Christina King	3131 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2023-11-28	12:15	Pending	Waiting for client feedback.
35	Andrew Young	3232 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-11-29	15:15	In Progress	Implementing client suggestions.
36	Stephanie Adams	3333 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2023-11-30	09:15	On Hold	Client on leave, rescheduling.
37	Brandon Baker	3434 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2023-12-01	13:15	Completed	Project completed ahead of schedule.
38	Karen Clark	3535 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2023-12-02	10:15	Pending	Awaiting client decision.
39	Gregory Lewis	3636 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2023-12-03	14:15	In Progress	Developing new product features.
40	Heather Walker	3737 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2023-12-04	11:15	On Hold	Client needs more time to review.
41	Timothy Hall	3838 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2023-12-05	08:15	Completed	Client praised the team's effort.
42	Christina King	3939 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2023-12-06	12:15	Pending	Waiting for client feedback.
43	Andrew Young	4040 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-12-07	15:15	In Progress	Implementing client suggestions.
44	Stephanie Adams	4141 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2023-12-08	09:15	On Hold	Client on leave, rescheduling.
45	Brandon Baker	4242 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2023-12-09	13:15	Completed	Project completed ahead of schedule.
46	Karen Clark	4343 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2023-12-10	10:15	Pending	Awaiting client decision.
47	Gregory Lewis	4444 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2023-12-11	14:15	In Progress	Developing new product features.
48	Heather Walker	4545 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2023-12-12	11:15	On Hold	Client needs more time to review.
49	Timothy Hall	4646 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2023-12-13	08:15	Completed	Client praised the team's effort.
50	Christina King	4747 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2023-12-14	12:15	Pending	Waiting for client feedback.
51	Andrew Young	4848 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-12-15	15:15	In Progress	Implementing client suggestions.
52	Stephanie Adams	4949 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2023-12-16	09:15	On Hold	Client on leave, rescheduling.
53	Brandon Baker	5050 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2023-12-17	13:15	Completed	Project completed ahead of schedule.
54	Karen Clark	5151 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2023-12-18	10:15	Pending	Awaiting client decision.
55	Gregory Lewis	5252 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2023-12-19	14:15	In Progress	Developing new product features.
56	Heather Walker	5353 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2023-12-20	11:15	On Hold	Client needs more time to review.
57	Timothy Hall	5454 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2023-12-21	08:15	Completed	Client praised the team's effort.
58	Christina King	5555 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2023-12-22	12:15	Pending	Waiting for client feedback.
59	Andrew Young	5656 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-12-23	15:15	In Progress	Implementing client suggestions.
60	Stephanie Adams	5757 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2023-12-24	09:15	On Hold	Client on leave, rescheduling.
61	Brandon Baker	5858 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2023-12-25	13:15	Completed	Project completed ahead of schedule.
62	Karen Clark	5959 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2023-12-26	10:15	Pending	Awaiting client decision.
63	Gregory Lewis	6060 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2023-12-27	14:15	In Progress	Developing new product features.
64	Heather Walker	6161 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2023-12-28	11:15	On Hold	Client needs more time to review.
65	Timothy Hall	6262 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2023-12-29	08:15	Completed	Client praised the team's effort.
66	Christina King	6363 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2023-12-30	12:15	Pending	Waiting for client feedback.
67	Andrew Young	6464 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2023-12-31	15:15	In Progress	Implementing client suggestions.
68	Stephanie Adams	6565 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2024-01-01	09:15	On Hold	Client on leave, rescheduling.
69	Brandon Baker	6666 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2024-01-02	13:15	Completed	Project completed ahead of schedule.
70	Karen Clark	6767 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2024-01-03	10:15	Pending	Awaiting client decision.
71	Gregory Lewis	6868 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2024-01-04	14:15	In Progress	Developing new product features.
72	Heather Walker	6969 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2024-01-05	11:15	On Hold	Client needs more time to review.
73	Timothy Hall	7070 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2024-01-06	08:15	Completed	Client praised the team's effort.
74	Christina King	7171 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2024-01-07	12:15	Pending	Waiting for client feedback.
75	Andrew Young	7272 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2024-01-08	15:15	In Progress	Implementing client suggestions.
76	Stephanie Adams	7373 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2024-01-09	09:15	On Hold	Client on leave, rescheduling.
77	Brandon Baker	7474 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2024-01-10	13:15	Completed	Project completed ahead of schedule.
78	Karen Clark	7575 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2024-01-11	10:15	Pending	Awaiting client decision.
79	Gregory Lewis	7676 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2024-01-12	14:15	In Progress	Developing new product features.
80	Heather Walker	7777 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2024-01-13	11:15	On Hold	Client needs more time to review.
81	Timothy Hall	7878 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2024-01-14	08:15	Completed	Client praised the team's effort.
82	Christina King	7979 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2024-01-15	12:15	Pending	Waiting for client feedback.
83	Andrew Young	8080 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2024-01-16	15:15	In Progress	Implementing client suggestions.
84	Stephanie Adams	8181 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2024-01-17	09:15	On Hold	Client on leave, rescheduling.
85	Brandon Baker	8282 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2024-01-18	13:15	Completed	Project completed ahead of schedule.
86	Karen Clark	8383 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2024-01-19	10:15	Pending	Awaiting client decision.
87	Gregory Lewis	8484 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2024-01-20	14:15	In Progress	Developing new product features.
88	Heather Walker	8585 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2024-01-21	11:15	On Hold	Client needs more time to review.
89	Timothy Hall	8686 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2024-01-22	08:15	Completed	Client praised the team's effort.
90	Christina King	8787 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2024-01-23	12:15	Pending	Waiting for client feedback.
91	Andrew Young	8888 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2024-01-24	15:15	In Progress	Implementing client suggestions.
92	Stephanie Adams	8989 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2024-01-25	09:15	On Hold	Client on leave, rescheduling.
93	Brandon Baker	9090 Ash St, San Jose, CA 95101	408-555-4567	brandon.baker@example.com	2024-01-26	13:15	Completed	Project completed ahead of schedule.
94	Karen Clark	9191 Hickory St, Phoenix, AZ 85001	602-555-8901	karen.clark@example.com	2024-01-27	10:15	Pending	Awaiting client decision.
95	Gregory Lewis	9292 Walnut St, San Antonio, TX 78201	210-555-2345	gregory.lewis@example.com	2024-01-28	14:15	In Progress	Developing new product features.
96	Heather Walker	9393 Cherry St, Fort Worth, TX 76101	817-555-6789	heather.walker@example.com	2024-01-29	11:15	On Hold	Client needs more time to review.
97	Timothy Hall	9494 Elm St, San Diego, CA 92101	619-555-0123	timothy.hall@example.com	2024-01-30	08:15	Completed	Client praised the team's effort.
98	Christina King	9595 Oak St, Austin, TX 78701	512-555-2345	Christina.King@example.com	2024-01-31	12:15	Pending	Waiting for client feedback.
99	Andrew Young	9696 Birch St, Dallas, TX 75201	214-555-6789	andrew.young@example.com	2024-02-01	15:15	In Progress	Implementing client suggestions.
100	Stephanie Adams	9797 Spruce St, Houston, TX 77001	281-555-0123	stephanie.adams@example.com	2024-02-02	09:15	On Hold	Client on leave, rescheduling.

Number	Date	Sex	Locality	Collection
42592	January 23, 1891	male	Swan Island, North Carolina	M.C.Z.
42593	" 25, "	female	"	"
42591	" 23 "	male	"	"

It will be noted that no birds in this series of juvenals were collected during the months of February, March, April and May. A caged bird as already mentioned lived until February 23 in juvenal plumage. It is evident from a study of these skins and those of the first nuptial to follow that a post-juvenal molt does not take place at the end of the breeding season and that the first nuptial plumage is acquired during the months from January to May. The plumage worn during the first winter is that of the juvenal.

FIRST NUPTIAL PLUMAGE

The description of the first nuptial plumage is based upon an examination of the following specimens.

Number	Date	Sex	Locality
1	May 29, 1921	female	Whaleboat Island, Maine
5	" " "	male	" " "
6	" " "	female	" " "

Collection of the Museum of Comparative Zoology

41030	March 1900	?	Eau Gallie, Florida
38915	May 19, 1890	male	Dry Tortugas, Florida
3943	May 2, 1871	male	Belmont, Mass.

Collection of A. C. Bent, Taunton, Mass.

7202	January 20, 1914	male	Westport, Mass.
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The first nuptial plumage is acquired, judging from the above specimens, by a partial molt between January and May. The time of this molt probably depends on the relative age of the bird. The post-juvenal or the first prenuptial as it should be designated in this case is partial and does not include the primaries, secondaries, coverts or remiges. The description is as follows:

Crown hair brown or Chaetura drab, streaked with light buff or warm buff, feathers of the side of the head and neck forehead streaked with white, those of the neck streaked with mouse gray. Back bister and in some specimens it approaches sepia. No streaking present in the feathers of the back as is present in this

part of the juvenal plumage. The greater and lesser wing coverts, primaries, and secondaries, and remiges same as in the juvenal except that they show the effects of wear. The prevailing color of the quill feathers is drab gray or light drab. Chin and middle throat white. Breast white with broad streaks of gray through the vanes of each feather, the gray is more pronounced in the feathers on the lateral portions of the breast. The belly is streaked with white and pale drab gray.

The colors of the iris and the naked parts of the bird are given in table of color changes. The detailed measurements of the birds in first nuptial plumage collected at Whaleboat Island are shown in the following table.

Date.....	May 29, 1921	May 29, 1921	May 29, 1921
Sex.....	female	male	female
Length (centimeters).....	65.3	66.4	65.6
Bill.....	7.1	7.4	7.5
Gape.....	10.5	10.9	10.6
Eye to tip of bill.....	9.2	9.6	9.6
Tail.....	10.8	11.5	10.9
Wing.....	29.8	31.1	30.4
Sixth Primary.....	19.2	19.8	19.5
Sixth Secondary.....	17.4	17.7	17.6
Extent.....	112.6	117.4	113.3
Tarsus with third toe.....	17.3	18.2	17.8
Toe-toe.....	13.6	14.5	13.9
Front middle or third toe....	9.1	9.2	9.1
Third toe nail.....	1.4	1.4	1.5
Hind or first toe.....	4.9	5.1	5.0
First toe nail.....	1.7	1.9	1.8
Weight (grams).....	833.4	846.5	861.8

Birds of the first nuptial plumage were common in the Sandy Neck rookery when I arrived there June 17, 1920, a time when there was no difficulty in confusing this plumage with the juvenal. I also found birds in the first nuptial plumage when I visited the Whaleboat Island colony the last week of May, 1921. Here for the first time I saw birds of this plumage active in nest building and incubating eggs. All the breeding birds of this plumage observed at Whaleboat were mated with birds of the second or of the adult nuptial plumage (I cannot distinguish the two latter plumages in the field), except in one doubtful case in which I

think both birds were in the streaked first nuptial plumage. To verify the supposition that the birds of this plumage were sexually mature three specimens were collected on May 29, in which the gonads were fully developed and functional. The largest ova of the two females (see preceding table of measurements) were 2.4 and 2.6 centimeters in diameter respectively, showing that they were nearly ready to burst from the follicles.

SECOND WINTER PLUMAGE

The specimens of the second winter plumage which were examined are as follows:

Number	Date	Sex	Locality
15027	August 11, 1895	female	Honolulu, H. Ids.
35083	September 1863	female	Western Mexico
4703	May 13, 1910	male	Canton, Mass.
3435	August 4, 1892	?	?
3332	July 4, 1908	?	Barnstable, Mass.

The specimens 15027 and 35083 are in the collection of the Museum of Comparative Zoology, Cambridge, and the others are in the collection of A. C. Bent, Taunton, Mass.

Specimen 15027. Crown greenish slate-black approaching somewhat the color of that found in the second nuptial plumage. There are many new feathers some only partially unsheathed. Sides of the head, neck and underparts similar to that found in the first winter plumage. The interscapular regions with numerous feathers in the process of unsheathing, the unsheathed parts of the new feathers dark olive green. Rectrices of 15027 and 35083 all new. Primaries, secondaries and tertials in a transitional state, both new and old feathers represented. The underparts in specimen number 35083 are white as in the second nuptial and contain no streaking such as is present in the juvenal and first nuptial plumages. This specimen collected in September is much more advanced than 15027 which was collected in August, with the exception of the crown which still has many of the brown feathers characteristic of the first nuptial plumage (second summer).

Specimen 4703. This specimen though it was collected in May represents the second winter plumage. It is a much belated plumage change.

Crown clove brown, the feathers very much lighter in color at the bases and with light, narrow median streaks involving the shafts and bases of the barbs. A few of the dark greenish black feathers characteristic of the second nuptial plumage (third summer) have appeared in the crown. Auriculars and sides of the head streaked with hair brown and buff. Back Prout's brown to mummy brown. The tips of the feathers of the first nuptial have worn away. A few dusky green feathers have appeared in the scapular region. The wing coverts are very much frayed and worn and since up to this time I have seen no signs of molting of these feathers, it is probable they are the same feathers worn by the juvenal. Many of the feathers have undergone such great wear that the large terminal spots have disappeared. The primaries and secondaries are also old and very much worn, but the tail feathers are new. The latter are drab in color. New feathers appearing in the region of the tail coverts light mouse gray. Throat white, some of the feathers with fuscous edgings. Feathers of the neck and underparts with median streaks varying from pale olive-buff to cream-buff, the edges of the feathers hair brown and chaetura drab. The colors in the region of the lower neck much darker. On the belly the brown and drab replaced by paler tones of gray.

Specimen 3435. This specimen is in a stage of plumage change much further advanced than the one just described. In the dorsal plumage many dark greenish black feathers have appeared. The wing coverts are new and the primaries and secondaries are in a state of molt, there being both new and old feathers and some are lacking. Otherwise this bird is similar to number 4703.

Specimen 3332. This specimen of Mr. Bent's collection has advanced much more than any of the others to the plumage of the second nuptial or third summer. Crown, neck and underparts as in the second nuptial, but the coverts and the wing and tail feathers are still in a transitional state, feathers of both plumages being present.

That the above plumages do not represent the first winter plumage as proposed by some ornithologists is evidenced by the fact that the birds kept in captivity never assumed such a plumage during the first winter and furthermore sexually mature specimens

have been secured in the first nuptial plumage described, a plumage which precedes the one I have designated as the second winter plumage. Since the second winter plumage as above described is represented by very few specimens in the collections I have examined I cannot be sure of the details but it is evident that the transition from the streaked juvenal plumage is brought about by a partial molt in the late winter or early spring and by a molt which involves all the large quill feathers of the wings and tail, in the fall of the second year.

SECOND NUPTIAL PLUMAGE (THIRD SUMMER)

The description of this plumage is based on the study of eleven specimens contained in the collection of the Museum of Comparative Zoology which also comprises the collections of Mr. Brewster and Mr. Bangs. It should be noted that all the birds representing this plumage were collected during the breeding season, May 2 to August 31, not one of them being collected during the winter months. The specimens are as follows:—

Number	Date	Sex	Locality
41905	May 2, 1887	male	Illinois.
55564	May 9, 1886	female	Barnstable, Mass.
42596	June 24, 1875	male	Illinois.
19067	June 27, 1888	male	Shelter Island, New York
19068	" " "	male	" " " "
19069	" " "	female	" " " "
19072	" " "	female	" " " "
1100	July 11, 1879	female	Marshee, Mass.
10793	July 20, 1879	female	" "
10792	" " "	female	" "
3944	August 31, 1875	female	Cambridge, Mass.

The bill, feet and the plumage of the underparts of these birds are similar to that of the adult. Crown dull blue-green with a metallic lustre somewhat like that of the adult but the area of the dark color is restricted. The posterior part of the frontal band of the crown tinged with brown, a mark which is not present in the adult birds. The wing coverts are drab or hair brown shading to a deep mouse gray in the scapular region. The scapular and interscapular feathers tipped with deep quaker drab, some of them with a slight greenish or bluish metallic lustre. The

skins, numbers 19068 and 19069, have a back plumage which more nearly approaches that of the adult but all of the skins of this plumage in the series can easily be distinguished by a duller color and brownish effect as contrasted with the bright greenish or bluish metallic lustre of the adults. The coverts and tertials of the second nuptial are light drab or drab as compared with the light mouse gray of these parts in the adult. The plumes are generally lacking, but if present are shorter than the plumes of the adults. Though there are striking differences between the second nuptial and adult plumages which can be recognized in the laboratory, it is difficult to differentiate them in the field. Indeed I was not aware that such a plumage existed until a comparative study was made of a large series of skins. The third winter and adult nuptial plumages are the same.

THE ADULT PLUMAGE

The adult plumage of the Black-crowned Night Heron is acquired in the autumn of the third summer after the bird has passed through the following plumages:

Natal	}	First summer
Juvenal		} The same
First winter		
First nuptial		Second summer
Second winter		
Second nuptial		Third summer
Adult winter		
Adult nuptial		

In the following table are the detailed measurements and weights of two adult herons collected July 13, 1920, at Sandy Neck, Mass., and three at Whaleboat Island, Maine, on August 13, 1920.

MEASUREMENTS OF ADULT BLACK-CROWNED NIGHT HERONS

Date.....	July 13, 1920	July 13, 1920	Aug. 13, 1920	Aug. 13, 1920	Aug. 13, 1920
Sex.....	male	male	male	female	female
Length.....	68.3	67.5	65.5	66.4	65.5
Bill.....	8.4	8.3	7.6	7.9	7.1
Gape.....	11.7	11.2	11.1	11.0	11.2

Eye-bill.....	10.7	10.3	9.9	9.7	9.7
Tail.....	12.1	13.1	12.7	12.3	12.0
Wing.....	32.8	33.6	32.7	32.1	31.1
Sixth Primary.....	21.5	21.9	23.9	19.9	20.1
Sixth Secondary.....	16.6	18.4	18.6	17.8	17.9
Extent.....	119.2	117.5	119.0	117.0	114.1
Tarsus with 3rd toe..	19.1	18.1	17.9	18.0	17.8
Toe-toe.....	15.4	16.1	14.4	13.6	13.8
Third toe.....	8.8	8.8	8.9	8.6	8.5
Third toe nail.....	1.7	1.5	1.5	1.4	1.2
First toe.....	4.8	4.9	5.4	4.9	5.0
First toe nail.....	1.5	2.1	2.1	1.8	1.7
Plumes.....	broken	20.2	18.5	16.8	17.5
Weight (grams).....	1007.00	1014.0	785.0	727.20	884.00

In addition to the adults included in the preceeding table of measurements the following adults have been examined.

Number	Date	Sex	Average length of plumes	Locality
10187	January 25, 1879	female	15.2	Watertown, Mass.
10186	February 1, 1879	male	19.8	" "
42594	February 14, 1888	male	18.5	Currituck, N. C.
41031	March 1900	?	none	Eau Gallie, Fla.
20841	March 25, 1908	?	none	Bolson, Costa Rica
15540	April 3, 1907	female	16.1	Wareham, Mass.
3942	April 21, 1870	female	13.5	Belmont, Mass.
80709	May 6, 1917	male	21.6	Essex, Mass.
818	May 20, 1888	female	16.8	Wareham, Mass.
19070	June 27, 1888	female	none	Shelter Id., N. Y.
19071	" " "	female	16.9	" " " "
19066	" " "	male	16.0	" " " "
16379	July 1892	male	11.7	San Jose, Costa Rica
1099	July 11, 1879	male	17.3	Mamplé, Mass.
31241	September 29, 1880	male	16.4	Uruguay
18137	October 19, 1887	male	17.3	San. Jose, Lower Cal.
18138	" 24, "	female	none	" " " "
29274	December 8, 1886	male	17.6	Desota County, Fla.
73186	December 17, 1892	male	broken	Kissenum, Florida

In the study of the above series of skins I find there are two periods of molt and feather renewal. A partial molt takes place in the spring and early summer which includes the body plumage but not the quill feathers, and a molt in October-December involving the primaries, secondaries and rectrices.

PLUMES

The average length of the plumes in the above series of skins is 16.8 centimeters. The average of the plumes of the females is 15.7 and that of the males 17.3 centimeters. From these measurements it would seem that the plumes of the males are longer than those of the females, but this series of skins is not large enough to form the basis of any general conclusion. Specimens 10187, 10186 and 42594 have plumes all of which are partially encased in sheaths indicating their appearance to have been recent. Two specimens collected in March have no plumes. Since these include all of the specimens of the series collected during January-March it is apparent that the molt and renewal of the plumes takes place during the first three months of the year.

Searles Biological Laboratory,
Bowdoin College, Brunswick, Me.

NOTES ON DONACOBIOUS.

BY LUDLOW GRISCOM.

I. THE STATUS OF *Donacobius alborittatus* LAFR. AND ORB.

IN 'Novitates Zoologicae,' Vol. 21, 1914, p. 158, Dr. C. E. Hellmayr showed that the type specimen of this species was "quite a young bird in fluffy plumage, and agrees in every respect with a skin from San Esteban, Venezuela." He, therefore, did not have the slightest doubt that the birds with white eyebrows were merely the young of *D. atricapillus*. He further stated that he had not seen any adults from Bolivia, but did not think them likely to differ from the Brazilian race, since specimens from Paraguay and southwest Brazil were practically identical with those from more northern localities. Exactly the same conclusions are advanced in a recent study of d'Orbigny's types (Nov. Zool., Vol. 28, 1921, p. 242).

While no one could question the soundness of the reasoning advanced above, it is a matter of interest that the American Mu-

seum of Natural History does possess a pair of adults in fresh unworn plumage taken July 22, 1915, at Todos Santos, Cochabamba, Bolivia (alt. 1300 feet) by Miller and Boyle. These birds have a broad white superciliary stripe, starting from just above the eye and running back to the very edge of the black cap. It is important to note that these feathers are immaculate white, while in young *atricapillus*, the feathers of the white eyebrow are always mottled at least basally with black, and the eyebrow itself is not so conspicuous or extended. Dr. Hellmayr discusses a specimen from northeastern Peru, which is apparently molting into the adult plumage, but still possesses a few white feathers in the superciliary region. This Museum has such a specimen from eastern Colombia. It has acquired the black cap and the barring on the flanks. The primaries, however, have not as yet been entirely renewed, the few white feathers in the superciliary region are mottled with black basally, and close scrutiny shows a few brown feathers still remaining on the sides of the head, all signs proving conclusively that it is not yet fully adult. With care this point is, therefore, seen to be easily determinable in *Donacobius*.

D. alborittatus is thus, strikingly distinct from *D. atricapillus* in possessing broad white superciliaries in the adult plumage, and for the present at least is best treated as a distinct species. I have seen no immature specimens from Bolivia, but follow Dr. Hellmayr's opinion that the two species are inseparable in this plumage. If true, there is nothing unique or surprising in the situation.

II. THE STATUS OF *Donacobius brachypterus* MADARASZ.

Dr. Chapman, when discussing this genus in the 'Distribution of Bird-Life in Colombia,' p. 530, followed Dr. Hellmayr in regarding *alborittatus* as a synonym of *atricapillus*, but called attention to the fact that there were two forms of the latter, applying the name *alborittatus* to the western one. This name, now applying to a distinct species in Bolivia, is naturally not available in the present instance.

In the 'Ornithologische Monatsberichte,' 1913, p. 22, Madarász described *D. brachypterus* from Aracatuca, near the coast of northern Colombia. This form was described as generally smaller and

paler, especially on the rump, and with shorter and more rounded wings. An excellent comparative description follows, with measurements. With the exception of the measurements it is of interest that Dr. Chapman's characterization of his western form is almost identical. A specimen from Cienaga is essentially topotypical and fully confirms most of the characters assigned to *brachypterus*. I am unable to see, however, that birds from northern Colombia are essentially paler below, and the difference in size is so slight that a larger series might eliminate it as a character altogether. Madarász' new form was based on females only, and he may have overlooked the marked sexual variation in size.

Donacobius atricapillus brachypterus Mad. is, however, a perfectly valid race, differing from typical *atricapillus* in being lighter above, especially on the rump and upper tail-coverts. It may prove to average somewhat smaller. These characters hold equally well for worn adults or immature, if specimens in comparable plumage are used. This race ranges from eastern Panama and northern Colombia up the Magdalena Valley to Puerto Berrio and Malena in the tropical lowlands of Antioquia. Specimens from Caquetá and Villavicencio on the eastern slope of the eastern Andes, as well as specimens cited by Dr. Chapman from localities in western Brazil unquestionably represent typical *atricapillus*, giving a much more logical distribution to the western race, now that its supposed occurrence in Bolivia no longer obscures the issue. It should be added that old "Bogotá" skins might belong to either race.

To summarize, then, the conclusions reached in this paper, *Donacobius* is divisible into three forms as follows:

1. *D. alborittatus* Lafr. and d'Orb. Known only from eastern Bolivia.
2. *D. atricapillus*, which is divisible into two races.
 - (a) *D. a. atricapillus* (L.). From Paraguay and Brazil north to Venezuela and the Guianas.
 - (b) *D. a. brachypterus* Madarász. Tropical lowlands of north central and northern Colombia to eastern Panama.

TABLE OF MEASUREMENTS.

		Wing	Tail	Culmen
<i>D. albobittatus</i>	1 ♂	86.5	98.	21.
"	1 ♀	79.	93.5	21.
<i>D. a. atricapillus</i>	13 ♂	81.-90.	92. -102.	20. -24.
"	9 ♀	76.-84.	87. - 95.5	19. -22.
<i>D. a. brachypterus</i>	11 ♂	79.-82.	92. -103.	21. -23.
"	4 ♀	76.-81.	87. - 95.	19.5-22.

American Museum of Natural History, New York.

NOTES ON THE BIRDS OF PORCHER ISLAND, B. C.

BY ALLAN BROOKS.

In April of 1920, I was travelling up the coast of British Columbia by the "inland" route on one of the fine passenger boats of the Canadian Government line.

To a bird lover the dearth of life along these quiet fjords, together with the monotony of the heavily wooded rugged shore-line, was rather depressing, but just before the mouth of the Skeena was reached there was a glimpse to the westward of an island totally unlike anything I had seen before on this northwestern coast.

A glance at the chart showed this to be Porcher Island, and I made up my mind to investigate this promising looking locality at a later date. An unfortunate accident reduced this visit from the month I had planned to only nine days in the month of September, but my friend Mr. Charles deB. Green during June and July of 1921, spent nearly two months on this island in an effort to solve the mystery of the breeding of the Marbled Murrelet, and he has generously supplied me with his notes together with the few birds he collected. Porcher Island, in latitude 54°, is about twenty miles long by fifteen wide. It is almost cut into three pieces by a Y-shaped arm of the sea, very incorrectly shown on all maps, and is singular in a densely forested region, in being for the most part open or scantily wooded. The highest mountains are only about 3000 ft., their crests covered with a thick mat of

recumbent yellow cedar and Sitka spruce which at a distance looks like turf.

The whole island is covered with a sponge of sphagnum and other mosses on a rock formation; about two-thirds of its area is muskeg, not flat but rising fairly rapidly from the shore-line.

A large proportion has been burned over a number of times and small bleached conifers are studded all over the muskegs. There are some stretches of fairly large timber—spruce, hemlock, and yellow and western cedar—still untouched by fire; also several streams and a number of small shallow lakes mostly covered with lily-pads.

The total precipitation is about 100 inches and the winters are mild.

The streams are full of salmon and trout and the muskegs covered with berry-bearing bushes—*Vaccinium*, *Empetrum*, etc., altogether a very promising looking country, but like all this portion of the British Columbian and Alaskan coast mammals and birds are amazingly scarce.

In its mammals Porcher island is the very opposite of the Queen Charlotte group lying to the west. Bear and marten which are common on the Queen Charlottes are unknown on Porcher, while Sitka deer and mink are common on the latter and not found at all on the former except where imported deer have been introduced.

It is strange to see the sphagnum bogs and grassy marshes without a sign of a runway of any species of Vole or Lemming-mouse, none seem to occur although the conditions seem so favourable.

Land birds are very scarce, the only exceptions being Bald Eagles and Ravens which are present in extraordinary numbers and may account to some extent for the dearth of other life.

A list of all the birds seen by Mr. Green and myself would be of little value as it would be in the highest degree incomplete. To save valuable space I shall record only the more notable species observed, but this will include all the birds known to breed on the island.

There are very few settlers on Porcher island although an attempt was made at one time to convert it into an agricultural community; the large number of deserted cabins attest the failure of the experiment.

The few remaining settlers mostly depend on fishing but all have gardens and all complain bitterly of the depredations of the flocks of migrating sparrows in the spring. These not only eat off the tender green plants but excavate large holes to get at the germinating seeds.

Their descriptions left no doubt as to the identity of the offenders. Fox Sparrows were the worst culprits, with Golden-crowned a close second. Some species of White-crown was also described, probably Gambel's. A Bluebird evidently the Mountain Bluebird and the Bittern were also described so that there could be no doubt as to their identity, as stragglers only. The notable birds of Porcher island are its Ptarmigan, Song Sparrow, and Jay. The two first indicate that it is the last outpost of the Alaskan Coastal fauna to the north-west, while the Jay links it with the dry interior to the eastward. Both Mr. Green and myself worked the northern end of the island only, from a landing made at Refuge bay.

Gavia stellata. RED-THROATED LOON.—A few pairs breed.

Brachyramphus marmoratus. MARBLED MURRELET.—Mr. Green's efforts to find the eggs were unsuccessful. No evidence of their breeding on the mountain tops was found, and his experience points to outlying islands beyond the reach of molestation by minks as the probable breeding place..

The birds were in evidence all the time and several likely looking burrows were dug out without being able to get to the end of the burrow with the tools at his disposal. In one case a fresh grass nest was uncovered some twelve feet down.

Cerorhinca monocerata. RHINOCEROS AUKLET.—Mr. Green found a large breeding colony on an island some ten miles from Refuge Bay.

Cephus columba. PIGEON GUILLEMOT.—Breeding.

Larus glaucescens. GLAUCOUS-WINGED GULL.—The only breeding Gull although *Larus brachyrhynchus* breeds on small lakes near the mouth of the Skeena on the adjacent mainland.

Mergus americanus. MERGANSER.—Breeding.—C. deB. Green.

Anser albifrons. WHITE-FRONTED GOOSE.—The very early southward movement of this far northern breeding Goose was noticeable. Flocks were noticed going over from September 6 every day.

These were all the small subspecies now identified by Swarth as *Anser albifrons albifrons*.

According to the residents this Goose remains all winter and suffers much from the persecutions of Bald Eagles.

Branta canadensis, subsp.? CANADA GOOSE.—These Geese are permanent residents and are probably the same as the large dark race of *canadensis* found on the Queen Charlottes and generally identified as *Branta c. occidentalis*.

Olor buccinator. TRUMPETER SWAN.—Swans usually winter in considerable numbers although reported as absent the winter of 1921-22.

From the description of their cry this must be the prevailing species.

A missionary found a pair breeding on an island north of the Skeena mouth a few years ago and took the two eggs as playthings for his little daughter after blowing them with a hole at each end. Mr. Green was told by the Indians that they always took the eggs for food whenever found.

Ardea herodias fannini. NORTHWEST HERON.—Common and must breed.

Totanus melanoleucus. GREATER YELLOW-LEGS.—A fairly common breeder; young were already hatched when Mr. Green arrived on the island the last week in May. This is two weeks earlier than I found them with young in the southern portion of the Cariboo district in the interior of the province, over one hundred miles to the southward.

Oxyechus vociferus. KILLDEER.—Seen by Green in June.

Aphriza virgata. SURFBIRD.—Five females and two males taken by Green out of a large flock, 12 July. All of the females and one of the males had very obvious incubating patches proving them to have bred, yet they all look like birds of the preceding year. They are in worn summer plumage with a lot of old winter feathers, especially on the pectoral region. The late Mr. Sidney Williams sent me several specimens from this region, he reported them in enormous flocks about Cridge passage a little to the southward in August and September. My migration records for this mysterious bird indicate that it leaves for its breeding grounds much earlier than the Black Turnstone and arrives earlier on its return journey. Theories in regard to the amazing habits of the Limicolae are dangerous, but this would indicate a breeding ground with an earlier accessibility than that of the Black Turnstone.

Hæmatopus bachmani. BLACK OYSTERCATCHER.—Breeds.

Gallinago delicata. WILSON'S SNIFE.—Rare in June (Green).

Dendragapus obscurus sitkensis Swarth. SITKA GROUSE.—Common. Fourteen specimens taken all show the pronounced characters of this handsome new form of the Dusky Grouse. The adult males are decidedly light colored without a darker pectoral band, in fresh plumage the feathers of the whole lower surface are conspicuously margined with whitish. One adult male taken September 9 shows a decided trace of eclipse, the feathers of the upper throat being rich rufous barred with black as in the female.

Females and young are all of the rich rufous type resembling the reddest phases of Franklin's Grouse, and are among the handsomest of all American

Grouse. The exceptional characteristics of Porcher Island make it an ideal home for this Grouse but their numbers are kept down by the attentions of the abundant Bald Eagles.

Lagopus lagopus alexandræ. ALEXANDER'S PTARMIGAN. The report of resident Ptarmigan was one of the principal incentives to my visit to this island. Only a few residents had ever seen them and others regarded them as a myth. Two ranges on which they were said to have been seen were worked unsuccessfully, nor did the higher ground with its dense mats of recumbent conifers seem suitable to Ptarmigan. After this the discovery of the bird by Green came as a delightful surprise as I had almost come to the conclusion that the birds seen by the residents were strays blown over from Prince of Wales Island, Alaska, which lies to the northward. Only one pair was seen by Green on the Belle Range, the most northerly mountain on the island; both birds were taken together with the nest of nine eggs. The birds are now in my collection and have been identified by Dr. Grinnell as extreme examples of this subspecies. This is a new record for Canada.

Accipiter velox. SHARP-SHINNED HAWK.—Common and probably breeds. A young female taken September 10 while dark colored is not conspicuously so, and is less rufescent than a very dark example of the same age taken the preceding month on Graham Island.

Buteo borealis, subsp.?—The Red-tailed Hawk of the region is probably the same as that of the Queen Charlotte group. In this the adults are of the variety with the underparts dark red, quite different from the type of *alascensis* in the Museum of Vertebrate Zoology which is of the ordinary light bellied variety. The young, of which I have a large series, are very uniform and uniformly light, showing a large unspotted cream-colored area on the breast. The majority of these are migrants from the Alaskan coast but they seem to be the full normal size of *Buteo borealis calurus*.

Haliaeetus leucocephalus alascanus. NORTHERN BALD EAGLE.—After the Raven the most abundant land bird. At the time of my visit in September the streams were packed with a run of Hump-backed Salmon and the Eagles could gorge themselves without effort, yet even on top of the highest crests the Eagles could be seen quartering the more open spaces.

I killed a pair of Grouse right and left, the second bird going about seventy-five yards before it fell dead in a clump of small pines; an Eagle appeared from nowhere, his wings half flexed, shooting along like a Goshawk and pitched in a tree just over the dead bird which was completely hidden in the thick scrub. I had to hurry up to save my game, this with a stream packed with salmon not fifty yards distant.

Falco peregrinus pealei. PEALE'S FALCON.—Resident, one young female taken.

Otus asio kennicotti. KENNICOTT'S OWL.—The wings and tails of a brood that were reared nearby seen in the house of a settler at Jap Inlet.

Ceryle alcyon caurinus. NORTHWEST KINGFISHER.—Resident.

Dryobates villosus subsp.? HAIRY WOODPECKER.—A Hairy Woodpecker is scarce, reported as breeding by Green—no specimens.

Sphyrapicus ruber notkensis. NORTHERN RED-BREASTED SAPSUCKER.—Numerous evidences of this bird's work were seen wherever there were alders.

Colaptes cafer saturator. NORTHWESTERN FLICKER.—Common.

Colaptes auratus luteus. NORTHERN FLICKER.—A hybrid which is nearer to this than to the preceding species taken. On the mainland near Prince Rupert a brood of pure bred birds just able to fly were seen September 16.

Cypseloides niger borealis. BLACK SWIFT.—Twice seen on migration in September.

Cyanocitta stelleri annectens. BLACK-HEADED JAY.—As Porcher Island is the nearest point on the British Columbian coast to the Queen Charlotte group, it was of special interest to see how closely its Jay approached the extreme form of the species found on the Queen Charlottes. Unfortunately Jays were scarce though said by the settlers to be usually common. I only saw three and lost one of these. The one taken proved a great surprise as instead of being a very dark bird like *carlottae* it resembles *annectens* from the dry interior.

There is a distinct trace of the white spot over the eye characteristic of the latter subspecies. In tone of color, entire absence of any brown tone on head, breast, or back, and length of crest, it agrees closely with a series of birds from Okanagan, but is slightly smaller in measurements.

The Okanagan birds are by no means uniform in the possession of a white spot over the eye, several have still less white than shown in the Porcher Island bird. This character is not diagnostic of *annectens* in British Columbia, however infallible it may be in the case of this subspecies in the southern portion of its range. In this connection see Taverner, Condor, Vol. XXI, no. 2, p. 83; and Riley, Canadian Alpine Club Journal, 1912, p. 63. A character of the Porcher Island bird that I have not seen in any other skin of the *stelleri* group is the abrupt transition of the black of the throat into the blue of the breast, which suggests a band of black on the upper breast.

Corvus corax principalis. NORTHERN RAVEN.—The commonest bird on the island.

Corvus caurinus. NORTHWESTERN CROW.—Tolerably common and breeding.

Pinicola enucleator subsp.? PINE GROSEBEAK.—A few breeding pairs seen by Green, no specimens taken.

Loxia curvirostra minor. RED CROSSBILL.—Breeding. (C. deB. G.)

Passer domesticus. ENGLISH SPARROW.—A mysterious stranger that had taken up its quarters in the chicken yard of Mr. Miller at Refuge bay proved to be a female of this pushing colonizer.

***Passerculus sandwichensis alaudinus*.** WESTERN SAVANNA SPARROW.—It is very unlikely that any Savanna Sparrow breeds on the island, none remain in summer on the Queen Charlottes. This subspecies was just commencing to arrive the first week in September.

***Junco oreganus oreganus*.** OREGON JUNCO.—Scarce resident.

***Melospiza melodia caurina*.** YAKUTAT SONG SPARROW.—This was the Song Sparrow found feeding along the beaches both on the island and adjacent mainland early in September. They certainly did not act like migrants. Six taken are very large and dark and identified by Mr. Swarth as typical *caurina*. No Song Sparrows were found on Porcher Island by Green in June but they were breeding on adjacent islands. He took no specimens, which is unfortunate as the resident subspecies of this region remains uncertain.

***Melospiza melodia rufina*.** SOOTY SONG SPARROW.—One specimen of this form taken on Porcher and one on the mainland near mouth of Skeena, both identified as *rufina* by Swarth. While this should be the resident form these two birds were undoubtedly transients in company with Lincoln's Sparrows passing south. I am strongly inclined to regard *caurina* as the resident bird as it undoubtedly is on the Queen Charlottes.

***Melospiza lincolni striata*.** FORBUSH'S SPARROW.—Summer resident.
***Iridoprocne bicolor*.** TREE SWALLOW.—Scarce summer resident (Green).

***Vermivora celata lutescens*.** LUTESCENT WARBLER.—Scarce summer resident (Green).

***Dendroica aestiva rubiginosa*.** ALASKA YELLOW WARBLER.—One taken 13 September at Refuge bay on the northern end of the island. Common at Prince Rupert on mainland two days later. The lateness of this migration is notable as Yellow Warblers have practically all disappeared from the southern interior (Okanagan) a month before.

Not noticed by Green so evidently a migrant only.

***Cinclus mexicanus unicolor*.** DIPPER.—Scarce resident.

***Nannus hiemalis pacificus*.** WESTERN WINTER WREN.—Resident.

***Regulus satrapa olivaceus*.** WESTERN GOLDEN-CROWNED KINGLET.
—Breeds, not common (Green).

***Regulus calendula grinnelli*.** SITKA KINGLET.—This is the commoner of the two Kinglets, the reverse being the case on the Queen Charlottes, where the Ruby-crown is a very scarce and local.

***Penthestes rufescens rufescens*.** CHESTNUT-BACKED CHICKADEE.—Resident.

***Hylocichla guttata nanus*.** DWARF HERMIT THRUSH.—Scarce summer resident (Green).

***Planesticus migratorius* subsp.?** ROBIN.—Robins are common on migration and a few must remain to breed although not recorded by Green. No specimens were taken. The Queen Charlotte bird is dark though not

more so than the darkest individuals seen in the interior of the province, and young taken there vary from dark to the extreme of paleness seen in the juvenile.

Ixoreus naevius naevius. VARIED THRUSH.—Scarce breeder (Green).
Okanagan Landing, B. C.

SOME ASPECTS OF THE GROUP HABIT AMONG BIRDS.

BY CHARLES L. WHITTLE.

IN the way of preface and to anticipate the criticism likely to be made by anyone reading the following article that the rather meagre data brought forward scarcely warrant discussion, I wish to say that my purposes herein are to assemble such detailed information as I possess, some old and some possibly new, in the hope that the matter will stimulate the search for new facts bearing on the questions discussed, and to speculate somewhat on the import of the observations thus far made.

Viewed in a large way, each species and race of birds during the mating season,—say of the Song Sparrow and the Fox Sparrow, the former nesting throughout the United States, much of Canada and part of Alaska—is in reality a large colony. Between the regions occupied at this season by the many recognized races of the Song Sparrow are zones of intergrading, geographical forms. It is self evident that such races and intergrades could not have arisen and could not survive were it not true that the individuals composing them, or their descendants, occupy, in a greatly preponderating way, the same regions year after year. Were it otherwise, were the different races to mix indiscriminately together or with the transition forms, the races would be extinguished and become one species by the swamping effect of the resulting intermatings. The various factors, such as relative humidity, amount of sunshine, temperature, etc., believed to originate geographical races, would be impotent to effect changes in species were the bird population continually shifting its nesting area. It therefore seems certain that such races and their intergrades as a whole must return each year to their approximate nesting places of the

previous season, and can accordingly be regarded in the first instance as a racial group, such a group occupying an immense area in the case of the Eastern Song Sparrow, (*Melospiza m. melodia*) or relatively only very limited areas in the case of the Kenai and Yukatut Song Sparrows (*Melospiza m. kenaiensis* and *caurina*), the eastern race occupying an area of 1,500,000 square miles more or less, the Alaskan races, referred to, occupying areas of hundreds of square miles rather than thousands, or even much less in the case of a California race of Song Sparrow.¹ It is quite easy to think of these latter races as constituting racial colonies; but the term applied to *melodia*, though equally accurate, has the distinction of being unusual.

The occurrence of smaller and more restricted colonies of nesting birds are of course too numerous to mention. Examples are Puffins, Murres, Cormorants, etc., among the less specialized species; Bank, Tree and Eave Swallows, Short-billed and Long-billed Marsh Wrens, etc., among the more differentiated species.

That many birds return each year to the approximate nesting place of the year before has now passed pretty well out of the realm of speculation. That this is so has long been a popular belief. And now comes experimental confirmation derived from the records secured from banding birds on their nesting grounds. Many birds, and probably most birds do this instinctively and both young and old often return not only to the approximate locality but to the identical place of their nativity. This instinct, in so far as it ensures the movement of birds in migration from their winter quarters to their nesting places, seems closely allied to if not identical with the homing instinct displayed by the Homing Pigeon in returning to its dovecote, and by the cat and dog in returning to their homes when forcibly removed for considerable distances. It does not, however, explain so readily the migration away from their nesting places, but probably the southern movement in the summer and fall had its origin in the lessening food supply in the nesting areas.

¹ An alternative view has been advocated that these intergrading zones are due to hybridism between adjoining races arising from the mutual encroachments of each race upon the territories of its neighbors, by dispersal from centers of origin.

In fact, how else shall we interpret the common experience that among many species of birds only such part of their nesting area is deserted by them in winter as normally fails to furnish the necessary food supply? Add to this the testimony of the well-known habit, possessed by some usually non-migrating birds, of becoming migratory only when a shortage of the food supply makes such migration obligatory. Any tendency in this direction would have had a selective value, and this tendency has now become an instinct. To us, however, many birds seemingly migrate an unnecessary distance to their winter homes, but this may be explained by remembering that the instinct may have been perfected at a time when climatic conditions made such migration necessary.¹

At this writing (January 28), we have at our banding station in Cohasset a group of seven White-throats, adults and immature birds, which have been coming to the feeding shelf for a month or more. They often come one, two, or three at a time, or towards nightfall, the whole group appears. They eat liberally, and then as a small unit they fly into some white pines nearby for the night. If they were not fed, they would have to move south or perish on account of the deep snow. This condition of affairs indicates that it was lack of food on their breeding grounds that gave rise to the instinct to migrate in the fall.

The problem of why birds migrate in the spring is probably older than the systematic study of ornithology and of course there is no hypothesis yet proposed that is acceptable to every one. It seems to me, however, that the homing experiments made with untrained Noddies and Sooty Terns perhaps shed some light on the problem.

The instinctive devotion of the parents for their young (the parental instinct), without which our highest animal life would

¹ Two recent banding records in Cohasset are worth recording as perhaps indicating that birds leave their home (nesting place) with reluctance even under weather conditions of great severity. A Song Sparrow "repeat" is reported by L. B. Fletcher. This adult bird, banded July 6, 1922, No. 28070, was retaken January 14 and again on January 28, 1923, at the same place. During the latter half of December and all of January the ground was covered deeply with snow and food was difficult to obtain. Still the bird stayed on refusing to migrate. This case has a bearing on the theory that among migratory species the local nesting birds move south and their places are taken by more northern birds. In New England one swallow is usually sufficient to make a summer and perhaps this wintering sparrow may be a straw that has told us which way the wind blows.

quickly pass away, represents probably the beginning of the instinct which later became the homing instinct. Certainly any feeble beginnings of the parental feeling among organisms would have been of survival value to the race, and would accordingly be likely to be perpetuated selectively. Under normal conditions these birds while nesting, particularly when feeding their young, often travel miles from their nests in search of food for their family. In the course of time the frequent returns to the nest became extended and intensified so that they came to include the annual migration to the nesting ground, not always to the exact spot perhaps, but to the nesting locality, with the result that in the spring migrations of an individual, race or a species, we seem to have merely the elaborated parental instinct at its maximum, for the two movements appear merely to differ in degree rather than in kind. Where shall the line be drawn between the instinct that directs Noddies and Sooty Terns to their nests in the summer from a point 850 miles away, and the instinct that directs an adult bird in the spring to its nesting place of the year before, or a young bird to the place in which it was born only ten months previously, whether the distance be one hundred miles or several thousand miles? Homing Noddies and Sooty Terns (*Anous stolidus* and *Sterna fuliginosa*), in going from Cape Hatteras in North Carolina to their nesting ground at Bird Key, Florida, in traveling across hundreds of miles of territory they never saw before, display the same kind of instinct that is displayed by birds of the year in migrating from the place they were born to their first winter home, in that both have to traverse unknown lands. For an account of the homing experiments with these birds see 'The Behavior of Noddy and Sooty Terns,' by John B. Watson in 'Papers from the Tortugas Laboratory of the Carnegie Institute of Washington,' Vol. II, (1908 (1909), pp. 187-225. What is more to be expected than that the old home—the nest, the young and the immediate environment with their pleasant associations—should be the magnet which draws the birds instinctively from their winter quarters when nesting time approaches?

It is of course patent that many species do not move from their summer to their winter quarters and back again in a body. It is also common knowledge that they do not as a rule migrate singly.

Some species assemble in mixed flocks during both spring and fall movements, but in such flocks it is not infrequently true that some one species largely predominates so that perhaps the remainder may often be considered as stragglers. On the other hand, there are certain species, particularly among the Fringillidae, Mniotiltidae, etc., which often and perhaps usually, migrate both north and south in groups of varying size. Examples of this class coming under my own observations are Myrtle and Yellow Red-poll Warblers (*Dendroica coronata* and *D. palmarum hypochrysea*); Ruby-crowned Kinglets (*Regulus c. calendula*); White-throated, Golden-crowned and Harris's Sparrows (*Zonotrichia albicollis, coronata* and *querula*); Fox Sparrows (*Passerella i. iliaca*); etc.

Everyone much afield in the winter time has witnessed the general tendency among many species to group themselves in small flocks. Such flocks probably become migrating units when spring comes. The organization and history of these flocks and the part they play in the biology of the species remains uninvestigated. A beginning, however, is being made in this direction by winter bird banding, and this method of study, when properly organized and systematically prosecuted, promises results of great scientific value. Reference will be made below to some of the data already obtained by this method of attack, observations having to do with the group habit among birds both in their winter and in their summer habitats. There is also some evidence that there exists something like orderly procedure in such migrating bodies and that there may be definite groups having perhaps family or neighborhood relations which constitute migratory units. This certainly appears to be true in some instances (see below p. 237, albinistic Sharptails). Moreover, it is probable that the routes followed in detail by such groups in moving both north and south are more or less permanently traveled. In addition there are occasional observations which indicate that groups of birds, as well as individuals, have a summer nesting area and also a more or less fixed winter residence and that the fixity of the winter home is probably determined, other things being equal, by the amount, the kind, and the dependability of the food supply at such places. No doubt birds move about over their normal winter range, or even may wander far therefrom according as food is scarce or plentiful, but if groups

of birds find an ample supply at any given place, they are likely to return to the same spot, if within their normal winter range, year after year (see results of bird banding in this connection below). Mr. S. Prentiss Baldwin's records made at his banding station near Thomasville, Georgia, show interesting examples of this kind. Here, about his house, which is close to his all-the-winter feeding places, a small group of White-throats has lived in a very limited area as a group or colony, "in the same patch of shrubbery at the end of the house," winter after winter, namely, from 1915 to 1922, omitting the winters of 1918 and 1919 when the station was not operated, as a group of six to twenty-one birds. Conjecture and unsupported belief as to the facts are eliminated in this case by definite proof obtained by retaking banded White-throats during five years out of the eight years that the station has been operated. Mr. Baldwin states it as his belief (see 'The Auk,' vol. XXXVIII, pp. 236-237) that these birds, which he calls a "neighborhood group," winter as a group, migrate north and south as a group, and as a proposition to be proven he believes the birds nest as a group. There are additional observations which confirm some of his conclusions and lend support to his most important proposition.

It appears certain that the dependability and abundance of the food supply at this point accounts for the presence of the birds in Thomasville year after year, but any similar bounty occurring naturally, as it often does, would no doubt be equally welcomed and equally patronized by such a group.

This station has also furnished in one season the astonishing record of twenty-nine "returns" of the Chipping Sparrow (*Spizella, p. passerina*) banded here prior to 1922 (see L. R. Talbot, 'The Auk,' vol. XXXIX, p. 344). The Chipping Sparrow, which does not nest south of central Georgia, accordingly occurs here as a winter visitant. There is no published analysis of the records of these returning Chipping Sparrows, but I prophesy that their history will run parallel to that of the White-throats in respect to group-wintering and in showing very local wintering range as a rule.

At this point it may be worth while to relate my experience with this species on its nesting ground in Peterboro, N. H. Several pairs nested in close association about a flower garden some fifty

feet from a house. In August, after the young were raised, the Sparrows all disappeared. On September 5, 1922, I was standing in the garden when from the north a flock of Chipping Sparrows suddenly settled down among the flower beds and about the house. Soon they flew into a hedge where a brood was raised that year, and others alighted on an elm and a cherry tree in the vicinity, trees much frequented during nesting time by this species. The flock, some twenty-five in number, was made up of adults and birds of the year. After resting for a time they as suddenly banded together and flew southward, I believe as a group of birds which nested in the congenial surroundings furnished by the shrubbery about the house and garden and which after moulting time returned to their home for a last glimpse before leaving the place for the season.

Among the banding records of the New England Bird Banding Association which Mr. A. C. Bagg made at his banding station at Holyoke, Mass. (in the Connecticut River valley) are some of particular interest at this time regarding the habits of the Tree Sparrow (*Spizella m. monticola*). Fifty-six individuals of this species were trapped and banded here during the winter and spring of 1922. These birds are referred to by Bagg as a "wintering flock." It is of great interest to note the happenings at this station during the following winter. On December 4, 1922, Bagg took his first Tree Sparrow return (22196), banded February 11, 1922. On December 11, two more returns of this species were reported (22188 and 22190), banded February 10, 1922. A fourth return was reported December 13 (22202), banded February 11, and on December 18 he had one more return (22198) and one more December 19 (21199), banded February 11, 1922. Writing on December 17, Bagg reports four "returns" still about his trap, indicating that a disposition exists to pass the winter a second time about this station, a place where satisfactory food abounds.

Considering the very limited number of trappers and banders in this country, who have thus far banded wintering birds for two successive seasons, and who, accordingly, have had no opportunity to obtain "returns" of their own birds, the amount of available evidence secured by banding, bearing on the group habit in migration and during the winter, is surprisingly great.

Of less interest, but still suggestive, is the prevalence of small groups of Tree Sparrows always observable in the region where this species winters. Such groups seldom contain more than twenty-five birds. An example of this kind came under my frequent observation during the winter of 1920-21 in the outskirts of Boston, Mass. A small flock of thirteen birds confined themselves within very narrow limits in the Arnold Arboretum from December to March. These birds were seen many times during the winter and were believed to be the same group on all occasions since the number remained so constant. At the time of leaving in the spring the flock had shrunk to twelve birds.

For over a decade in Great Britain, banding ("ringing") of nestlings has been practiced and to a limited extent adults have also been trapped. Sufficient data have been secured to warrant the statement that there is a marked tendency for certain British species of birds, both adults and young, to return to their nesting grounds of the previous year. Some of the evidence will be shown by the following data: H. F. Witherby (personal communication) writes that a Willow Warbler (*Phylloscopus t. trochilus*), No. F, 21, ringed June 26, 1911 as a nestling, returned in 1912 to the same spot and was found June 18, sitting on six eggs; and another nestling of the same species (No. J. 619), ringed June 15, 1912, was taken at the same place in 1913 on May 4th. Fourteen nestling Song Thrushes (*Turdus p. clarkei*) have been taken, usually the next year after being banded "at or near" the same place, and twenty-one Blackbirds (*Turdus m. merula*) were similarly retaken at or near the same place they were banded as nestlings. The exact meaning, however, of "near" is not quite clear in several instances, but the returns in the cases cited have always been made in the same township.

The case for Great Britain is summed up by Howard ('Territory in Bird Life', p. 281) as follows:—

"That the older birds return to the locality wherein they had formerly reared offspring, and the younger to the neighborhood of their birthplace, was always deemed probable. But in recent years evidence which cannot be rebutted has been supplied by the marking of birds. This evidence, details of which can be found in the summary of results published an-

nally by Mr. Witherby in 'British Birds,' demonstrates that the adult frequently returns not only to the same locality in which it formerly bred, but even to the same station; that it does so year after year; that this mode of behavior is not peculiar to sex; and that many of the young breed in the locality in which they were reared."

Commenting on this custom, Howard (p. 50) says that this habit ensures uniform distribution and is therefore of benefit to the race. It also gives the assurance of suitable places to nest—and on the average, the kind and quality of the necessary food at the critical time of feeding the young birds in the nest. Moreover, the custom gives rise to local groups possessing elements of permanence. It does more than this, for the habit leads to isolation or semi-isolation according as the groups are widely scattered, due to the infrequency of suitable nesting conditions; or close together, due to the great abundance of suitable nesting conditions, closely spaced. The Eastern Song Sparrow exists under the latter conditions and the Pacific coast races of *Melospiza* have arisen under the former conditions. Not only so, this habit strongly indicates that however imperfectly organized the groups may be, some degree of isolation must result. Since the homing instinct exists and is believed to be demonstrably the cause of birds returning each year to the nesting ground of the previous year for breeding purposes, the presumption that family groups also exist, and this independently of any collateral evidence, is strongly indicated. Some ornithologists writing a decade ago, and the same views are frequently met with even at the present day, assert that the evidence indicates that it is the adults that return to their nesting places rather than the young birds. Taverner ('The Auk', vol. XXI, p. 331) states that "it seems universally true that young birds do not often return to breed in the immediate vicinity of the place where they were raised." If this were the case, it would be necessary to explain why birds are more likely to return to a place after an absence of one or more years than after an absence of less than one year. However, the practice of banding nestlings, in Great Britain at least, as shown above, establishes the fact that many young birds do so return. Taverner refers to the failure of the young to return as a "dispersal influence."

and Grinnell ('The Auk,' Vol. XXI, p. 373) believes that "Nature . . . resorts to all sorts of devices to insure the spreading of individuals over all the inhabitable regions." This would mean that the races of say the Song Sparrow would be wiped out by swamping if the individuals of each race were to spread into the "inhabitable regions" occupied by the other races, for it is no doubt true that suitable nesting localities, for, say the Sooty Song Sparrow, exist immediately outside its nesting range and within the ranges of other races of Song Sparrows. That they do not do this is pointed out by the same writer in these words: "we never find two 'sub-species' breeding in the same faunal area . . ." (ibid. p. 373). On account of the strong disposition to return to the old nesting ground, it seems to me that the tendency among the individuals of the resulting family group is to remain together, other things being equal, until increase of numbers from any cause forces expansion of the nesting area. It is believed that because of these little groups, occurring even well within the nesting area of a species, natural selection, acting upon variations of a survival value arising therein, may often prove effective.

As illustrating an apparent case of song variation in a group of birds, the following facts may be of interest:

A number of Purple Finches (*Carpodacus p. purpureus*), nesting about a group of farm houses near the village of Peterboro, N. H., were observed to sing an elaboration of the usual simple warbling song of this race as I hear it sung throughout New England. This song variation consists of a pause at the close of the warble, followed by four (sometimes six) more ambitious slurred notes that may be rather accurately anglicized by the words "de-ar Ma-rie" or "de-ar, de-ar Ma-rie." These notes are rather slowly uttered, the first two or four being on one note and the last several tones higher. Whether or not this variation is sung by this race elsewhere I do not know, but it is reasonably sure that so far as this section of New Hampshire is concerned it is very infrequently used if at all. In 1920, four nesting males sang the variant, in 1921, three birds were heard doing so; and in 1922, seven birds did so. These birds have therefore occurred here as a well-marked group for at least three years and they all nest within an area estimated at twenty acres. Their peculiarity of song points to

their being a family group, resident here in the summer, and on the whole, increasing in numbers. If, accompanying the variation in song, there is also a physical variation that gives them an advantage over their neighbors of the same race, and the number continues to increase, we may expect dispersal to take place with the probability that birds singing this song variation may come to occupy a large area in course of time to the exclusion of the parent form. Dr. Brewer states in 'North American Birds' (Baird, Brewer & Ridgway, vol. 1, p. 463) that seven pairs of this species nested together harmoniously one summer as a group about his grounds in Hingham, Mass., two pairs even nesting in the same tree.

At this point 'The Condor' for November-December, 1922, appeared on my desk and on pages 193 to 203 Richard Hunt has an interesting article on the "Evidence of Musical 'Taste' in The Brown Towhee." Hunt, suggestively enough, describes two examples of the Brown Towhee (*Pipilo crissalis crissalis*) elaborating his own simple song *at its end* by adding in one case part of the song of the Western House Wren (*Troglodytes aëdon parkmani*), and in the other case adding "a perfectly good chirp of the Linnet" (*Carpodacus mexicanus frontalis*). In this connection Hunt writes at some length on the origin and purpose of bird song, considering these two variants of the Brown Towhee's song as imitations and concluding that it is by imitating other bird's songs that the evolution of bird song takes place. He regards the fact that these two "off" songs, sung many miles and three years apart, being so remarkably alike as indicating that a "racial rather than an individual tendency is at work" (p. 194). Referring again to the Peterboro Purple Finches, it should be mentioned that while I cannot trace with certainty their elaborated song to an imitation of any other bird's song, it possesses a form suggesting a portion of the song of the American Goldfinch (*Astragalinus tristis tristis*). The accordance of the manner the Brown Towhee and the Purple Finch elaborate their songs, calls for special mention in that the same order obtains in each case.

Hawkins ('The Auk,' Vol. XXXIX, p. 53), in writing of sexual selection and bird song, concludes that "wherever a variation appears in a single individual in its song that variation seems to

vanish in its offspring but wherever there is a variation which is common to a group of individuals that variation appears to survive in succeeding generations," and he raises the question if this apparent law is the true biological background of the origin of races and species. On page 51 Hawkins restates the law and here his meaning of the word "group" is more definitely given, thus: "In the east a variation may occur now and then in an individual but is lost in succeeding generations, while in the west where the variation occurs in a group of birds it survives with the result that a new subspecies evolves."

It is interesting in this connection to note the occurrence of a group of Ruby-crowned Kinglets (*Regulus c. calendula*), occupying many thousand square miles in the western part of Montana, which sings a marked variation of the eastern Ruby-crown's song (see A. A. Saunders, 'The Auk,' Vol. XXXVI, pp. 525-528). Another instance of local song variation came to my attention in August, 1922, at Wrangel, Alaska. A thicket of Devil's Club (*Falsia horrida*) close to the ocean harboured three or four Song Sparrows, presumed to be *Melospiza m. rufina*. These birds are not believed to differ from this race in plumage or in size, but they used a series of most un-Sparrow-like, scolding notes not heard by me from others of this race which I encountered in several places on Kupreanof Island, forty-six miles northwest, and not used by any other race so far as I know. Several times on approaching their retreat one of the birds would emerge at the top of the Devil's Club and pour out a torrent of rapidly-uttered, protesting notes which resembled nothing so much as to quality as the scolding notes of the Western Winter Wren (*Nannus hiemalis pacificus*). These birds were singing freely and their song was recognizably similar to that of *melodia*, but at times the quality seemed somewhat different. On occasions, they repeated their song over and over in a kind of unemphasized warble, with only infrequent slight rests, for fully a minute and a half. I have no knowledge of the extent of the area occupied by the birds possessing these local peculiarities. The area may be very local, as is the case with the Peterboro Purple Finches above described.

Another example of a well-marked group or colony of presumably non-migrating birds, the Santa Cruz Chickadee (*Penthestes ru-*

fescens barlowi) has been noted by J. Grinnell (see 'The Condor,' Vol. XXIV, pp. 182-183). These birds are described as living as a "well-established and rather far sequestered colony" in a tract of Monterey pines, having an area of several square miles, situated near Cambria, California. The nearest area of these trees to this isolated tract of pines is at Point Sur some seventy-five miles away, and as far as known, there are no Santz Cruz Chickadees in the intervening territory. In a personal communication Grinnell quotes Mr. Dixon as stating that in an area of these pines of one square mile situated south of Cambria he actually saw about twenty of these birds of which five were collected. These, according to Grinnell "averaged paler, nearer white on the mid-ventral surface" than comparable members near Monterey, noticeable differences which, however, he does not regard as constituting phylogenetic significance. This varietal form is presumably the product of its environment and should be regarded as a color phase which in the course of time may become a race, and ultimately perhaps a species. Our immediate interest in the matter, however, is that it is the isolation due to the exceedingly local distribution of the Monterey pine (*Pinus radiata*) which has given this particular environment sufficient time to effect the changes described, and that this would be the case, though perhaps more time would be required, were the Chickadees migratory but still subject to the instinct to return each year to the same nesting grounds. Any group of birds composed of a single species or race nesting under conditions of isolation and giving rise to mutants or variations of selective value would be similarly favored provided the isolation were as complete; and in whatever degree isolation is obtainable through the action of the homing instinct in giving rise to family or neighborhood groups, then in just that degree is this instinct a force operating to bring about the evolution of races and species. One naturally raises the question: if indeed variations occur among family groups from time to time, first here and then there, what part such variations play in giving rise to the "puzzling intergrades," unnamable forms and "incipient local forms" noted by species splitters.

The most interesting observations, apparently bearing on the existence of nesting groups, have come from another source and

this a most unexpected one. In 'The Auk' (Vol. XXXVIII, pp. 604-605 and Vol. XXXIX, p. 265), A. T. Wayne describes the finding of albinistic Sharp-tailed Sparrows (*Passerherbulus caudatus*) for twenty-two consecutive years at the same locality near his home at Mount Pleasant, South Carolina, the seasons being in the fall or winter. He describes the occurrence thus: (p. 605) "This strain of albinism in the Sharp-tailed Sparrow has held uninterruptedly year after year in this little realm, which embodies only a few acres of high land. . . . Since 1900, I have taken about twenty-five Sharp-tailed Sparrows on this little piece of land, all of which showed albinism in a greater or less degree, and all taken exhibited the black spots on the abdomen." Such an occurrence of albinism is of great physiological interest in itself, but in the present case another aspect of the matter needs investigation, namely, what were the conditions under which the supply of albinistic birds at this place originated? This race of Sharp-tails is not known to nest further south than Virginia; they are accordingly migratory in South Carolina during the fall and winter seasons. Wayne's record of birds taken stands at about twenty-six individuals while others were seen by him.

Albinism is an hereditary character. The occurrence of such birds here so regularly may be explained by assuming that they migrated from scattered places of origin and segregated here in winter quarters as a group. I believe this to be an improbable explanation because it takes no adequate account of how a constant supply originated or the constancy of the black spots on the abdomen. A second hypothesis is that these birds constitute a small wintering group which is also a nesting group, and this view explains, I think, the source of supply and the peculiar abdominal markings and leads to speculations of a much more general interest as well, particularly whether or not the groups of birds of a single species which are commonly seen during the spring and fall migration, groups which bird-banding data indicate winter often as groups, also nest as groups, that is, return year after year to the same spot or to the same locality to nest. Some of the evidence that certain groups do return to their nesting grounds of the previous year has already been given. But, while there are only a limited number of direct observations indicating that such groups

do return, I raise the question if the constant supply of albinistic Sharp-tailed Sparrows, occurring for a consecutive period of twenty-two years at a given locality in its winter quarters, does not in itself inferentially constitute a strong presumption that such birds were raised where inter-matings with the normal Sharp-tails were of so infrequent occurrence that swamping did not take place. A small group of albinistic sparrows by inter-breeding year after year and migrating to the same spot to pass the winter would satisfactorily account for the phenomenon observed.

Mr. Wayne on one occasion saw as many as three such birds together and he collected twenty-five birds in all, each showing albinism, and all having black spots on the abdomen. We do not know how long the Sharp-tail lives or the ratio of surviving young to those which perish from one cause or another, but it is a fair presumption that the number seen plus those collected by Mr. Wayne during a period of nearly a quarter of a century constitute perhaps not over ten per cent. of the birds actually born during this time. Whatever the ratio may be, the source of supply, the manner in which this supply reached its winter quarters and returned, constitute problems of very great interest. It is, I believe, more than a coincidence that this protracted case of albinism should occur in a species whose nesting places are restricted to salt marshes. By hypothesis a group of this species, capable of keeping up the supply of albinistic birds required, would more easily survive intact than if the albinism occurred among some other species less insistent on particular nesting localities, for the distribution of salt marshes, in the nature of the case, is such that nesting places are occasionally wide apart, thus giving rise to the semi-isolation needed to enable such a group to maintain itself without danger of contact with normal birds at nesting time.

It seems certain that the constant supply of these birds for so long a period could only have been maintained by a family group whose integrity remained unimpaired during this time. If this view of the matter is correct, it of course follows that any inheritable variation arising within such a group would have a like chance to be perpetuated and perhaps to become the nucleus of a race or species, and this must be true, in particular, where the home of a family group at nesting time coincides with complete isolation such

as the Santa Cruz Chickadees enjoy, or the semi-isolation, due to the scarcity of nesting localities, which for example, the Song Sparrow often finds on the Alaska and the California coasts (see below).

In studying a map showing the nesting range of different species of land birds today in the United States east of the Mississippi, it is profitable to attempt to picture the nesting range, say of the Song Sparrow as it existed here prior to, let us say, the year 1700. From our knowledge of the kind of nesting localities chosen by this species we shall at once realize that the primeval forests of two hundred years ago which covered a large part of its present nesting range, especially the coniferous growth, harboured relatively few breeding birds. Such a picture would doubtless be correct and the explanation is not difficult: primeval forest conditions make for paucity of numbers of this species by limiting the nesting localities. Limiting the number of nesting localities, on account of the homing instinct, introduces favorable conditions for the perpetuation of local variations and such mutants as arise, the fewer the number of localities and the more widely they are separated from one another, the more easily races and species, *caeteris paribus*, may be evolved. Conversely, the greater the abundance of such localities and their proximity to one another, the greater the probability that the type will persist. The Eastern Song Sparrow with its enormous range and constancy of character is the product of the latter condition; the numerous northwestern, Pacific coast races of *Melospiza* are the products of the former order of conditions, there spread out before the observer in the most illuminating manner.

In considering the nesting localities of North American birds from the point of view of bird groups, we must try to realize something of the ever-changing conditions that of necessity occurred throughout the immense past. British Columbia and Alaska, along the coast, are in one of the phases of that primitive condition. An observer is at once impressed on going there by the solid forests of conifers which cover the mountains up to several thousand feet and descend nearly everywhere to the ocean's edge and extend northwest for over a thousand miles. The decrease in deciduous growths as one goes northward is also very marked and this decrease is represented more and more by very local occur-

rences of such plants. Theoretically, therefore, we ought to find more constancy, i.e., fewer race variations among species inhabiting the coniferous forest than among those species whose nesting localities are restricted to more or less open deciduous growths of trees and shrubs occurring occasionally along streams or the shore, such as small aspens, willows and alders, and this is what we do find. The easterner will not fail to note the fact that such patches of willows and alders are often miles apart in certain sections and occur as small thickets situated notably at the upper ends of little bays where a small stream often enters. Here the Song Sparrows nest, perhaps in family groups, and their distribution is just as local and just as isolated as the thickets themselves. Moreover, these patches of deciduous growths are only able to exist because in the close and complex competition for the occupancy of such areas, between the conifers and the non-conifers, the latter are best fitted to do so, and such adjustment is relatively of a very permanent character (probably often existing for centuries in Alaska) in primitive regions where man has not been continually destroying nesting localities in some sections and creating new ones in others.

King Street, Cohasset, Massachusetts.

THE MOURNING DOVE (*ZENAIIDURA MACROURA CAROLINENSIS*) AT PANORA, IOWA.

BY L. L. SNYDER.

Plate XV

THE following paper records the present status and some of the habits of the Mourning Dove (*Zenaidura macroura carolinensis*) in the vicinity of Panora, Iowa, with special reference to a nesting pair which exhibited either peculiarities, or, if typical, behavior not usually recorded. Panora is in the center of an agricultural district, the region to the north and east being a rich, level prairie, while immediately south and west of the town the Middle Raccoon River has cut its course along the terminal moraine of Iowa's last glacier. This rugged section is more or less wooded, but

beyond, a rolling farm country extends. The groves, orchards and shade trees of the surrounding farms furnish ideal nesting sites for the Mourning Dove and it finds food in abundance in the grain fields, hog lots, along the railroad right-of-way and country roads. Because of these favorable conditions, together with a lack of shooting, the species is an abundant one. It invades the town to nest, building in the shade trees along the streets and about the lawns.

The species is an early spring arrival, pairs being seen during the first week of April. Nesting is soon started, reaching its height in May, but some pairs are thus occupied until late August. The usual number of broods is two, but it is probable that some pairs rear three. I have never observed any spectacular courtship performance on the part of the male bird,¹ but he is at all times attentive to the female except when nesting duties separate them. One seldom sees a lone bird in summer, this being especially noticeable when making a railroad journey through a region where Mourning Doves are abundant. In late summer the young and old congregate in small flocks which may be seen picking up waste grain and the seeds of many plants along the country roads or in open fields. Occasionally a few remain during the winter, a flock of sixteen birds having been reported to the writer as feeding about a farm yard during the month of January, 1922.

The nesting site, speaking of the species throughout its range, is greatly variable, but in this locality I have known them to use only trees or climbing vines, the elevation varying from four to fifteen feet. A horizontal limb is often selected, although a heavy fork in orchard trees is commonly used. They seem to show a preference for evergreen trees which are commonly planted for windbreaks bordering farm yards, but fruit trees, willows, walnut, box elder, maple and oak are also suitable for them. Wild grape vines are frequently used if favorably situated. I have seen the Mourning Dove make use of a discarded Robin-nest as a foundation for its own simple structure, but I have never observed it using the nest of another species without constructing its own nest upon it. The material used in building the nest is small twigs,

¹ Barrows, Michigan Bird Life, p. 253.

rather uniform in size, and occasionally a lining is added, made from dry grass.

The male bird is, apparently, as attentive to nesting duties as is the female. According to Bendire the female builds the nest unaided,² but the pair under observation during June and July, 1921, both participated in constructing the nest. The male was seen carrying material which the female placed in position. After the nest was completed the two eggs were deposited at an early hour on consecutive days. The male was always found on the nest during the day, and by the use of a flashlight the female was found covering the eggs at night. Sex identification was easily made, both birds being well marked, and the nest was located directly under a window of the house where I was staying. Incubation required fourteen days, the eggs hatching on consecutive days as deposited. They were covered at all times, the parents changing rather regularly between eight and nine o'clock in the morning, and five and six o'clock in the afternoon. If flushed from the nest the parent feigned injury, especially if pursued, but would soon return when all was quiet. The newly hatched young were covered by the parents almost continuously for four days. Their condition at that time was extremely altricial but they developed rapidly. Although the nest was not under observation constantly, on no occasion did I see the female feed the young, but from a distance of six feet I frequently saw the male feed them. On several occasions the female was seen in the nesting tree but not near the nest. Judging from the number of occasions on which the male was seen feeding the young it seems evident in this case that the male performed the major part of this duty.

After the young had developed into half-grown birds, the approach of the parent caused them to stand in expectancy, their wings quivering in excitement. Both young would thrust their beaks into the parent's gape simultaneously, the softened food being regurgitated into the throat by a pumping movement of the parent's head and neck. This was an amusing procedure, giving one the impression that the young had become caught and that the parent was striving to free them. After feeding, the male

² Life Histories of N. Am. Birds, p. 142.



2. Feeding the young.

MOURNING DOVE.

1. Settling on eggs.



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would frequently remain near the nest for a time, sometimes giving his soft call notes. No attempt was made on the part of the parent to clean the nest, nor did the young exhibit any instinct which assisted nest sanitation. The sanitary importance of this is small since the droppings soon dry, but I believe they aid materially in supporting the loose twig structure at the time the young become most active in the nest.

In the intervals between being fed the young usually squatted quietly in the nest, both facing in the same direction, but at times they would exercise by stretching their legs and wings, or by clinging lightly to the nest with their feet and rapidly beating their wings. A day or two before leaving the nest they would walk out and back on the supporting limb. This encouraged them to venture still further, finally abandoning the nest entirely. They remained in the nesting tree for two days before they were seen to fly to the ground beneath. Once on the ground they eagerly searched for food, flying back to the tree if startled. After the first day of this precocial existence they disappeared from the vicinity altogether.

Three days later, on July 3, the parents started remodeling the old nest. This was completed in two days and on July 5th an egg was deposited in the nest. On the following day a second egg was deposited. These hatched on July 19 and 20 respectively. Up to the time when my stay was ended the behavior of the pair was without variation from that recorded on the first brooding.

The Mourning Dove is one of the species that has become adapted to the conditions brought about by man. It flourishes in this cultivated area where nearly all trace of original conditions has been erased. It is almost as much at home on an Iowa farm as is the Domestic Fowl and the ventriloquial call of the male is ever associated in my mind with this agricultural region. In its relation to agriculture the species has been proved an asset. Because of this, and other features such as a growing public sentiment in favor of bird portection, it does not face the dangerous agencies which must have destroyed the Passenger Pigeon. When one considers the habits of the species: that it is a poor nest builder; that its eggs are conspicuously white and few in number (2, frequently 1); that the nest is often placed with inadequate support,

it seems there are numerous chances for disaster. The present status of the species, however, proves that these dangers are insignificant in their effect. I have seen the young of the Mourning Dove successfully reared in a nest located in a fallen willow which had lodged in another tree in a most precarious position. While not a prolific species, both parents are diligent workers in attending to nesting duties. They are not easily discouraged, enduring mishaps in a hardy manner, usually replacing a failure by a success. After examining their habits and considering the ecological conditions of the region, the future status of the species may be predicted as favorable.

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REMARKS ON METHODS IN MEASURING BIRDS

BY (MRS.) ELSIE M. B. REICHENBERGER.

WHEN we look into the history and development of methods of measurements now current in Europe and in America we are forced to conclude that they have originated from the judgment of one or two ornithologists in each hemisphere. There does not seem to be evidence that either the European or the American systems are the result of deliberation on the part of the combined profession such as I have been assured is the case in engineering, which science is also dependent upon precision of measurement.

I have had the privilege of discussing with Mr. Robert Ridgway and others the history of measurements during the past fifty years. In the 'Manual of North American Birds,' 1887, p. 9, Mr. Ridgway in speaking of wing measurements writes as follows: "Length of wing is from the bend or carpal joint, to tip of longest primary, the rule being laid along the outer or convex side and the wing brought up close to it for its entire length." However, in his later work in the 'Birds of North and Middle America,' 1901, Part I, p. xv, we notice the change from the European method previously employed to the then established American method. When I asked Mr. Ridgway to give me information about methods formerly in use and why or when he had changed, he wrote and gave me

permission to quote him: "I am glad to comply with your request for information as to why I changed the method of measuring the wings of birds from that followed in the preparation of the 'Manual of North American Birds' when I took up the 'Birds of North and Middle America.' Unfortunately I cannot give you exact data on the subject. I thought it was a matter of record, but I have not been able to find anything in print substantiating that impression. However, I will state from definite recollection that at one of the meetings of the Committee on Classification and Nomenclature of the A. O. U.—which one I cannot remember—the subject of measurements was freely discussed and it was agreed that measurements should be taken according to the method which I adopted in 1894, namely, measuring the wing with dividers, and the tail by inserting one point of the dividers as close as practicable between the shafts of the middle pair of rectrices. I will add that while I approved the new method of measuring the tail, I did *not* approve of the new method of measuring the wing, which I agree with you in believing is far less accurate than the other method. In fact I changed the method only out of loyalty to the A. O. U."

Dr. Witmer Stone is one who, despite the change of American sentiment, has continued to use the European method of wing measurement which he, too, considers best.

When I asked Dr. C. E. Hellmayr what caused him to use the European method which he has always employed he stated that Count Berlepsch and his other predecessors had always used that method and he had seen no reason to change it.

At Tring I talked the matter over with Dr. Ernst Hartert who some years ago had written a paper on measurements and who is now not very hopeful concerning the adoption of a universal method of measuring.

Having spent the last six months abroad endeavoring to become better acquainted with South American birds, I have more than ever been struck not only with the importance of exactness but of uniformity of method in measuring the external parts of birds. At my headquarters in Munich, specimens from all the larger museums of Europe, such as Vienna, Berlin, Frankfort, Tring, and the British Museum were available for my use, and it was not unusual to have a series of seventy-five specimens for the more difficult problems.

I feel that a compromise could be made between the Old and New World systems of measuring. Most continental Europeans use a rule with which to measure the tail, the wing, and the culmen, whereas Americans use dividers for all three measurements. Could we not agree to measure the wing, straightened out, with a rule such as is generally used in England? This rule has a small piece of metal about half an inch high riveted across its left end. The wing is held against the metal which serves to align the wrist with the zero point of the rule. In using the dividers for the wing, as we do, the wing retains the curvature of its primaries as well as the bent position of the manus it has often taken in drying. If the feathers are not straightened, a shorter measurement results, whereas in placing the wing on the rule and flattening it, it assumes its full length. For this reason I believe the first compromise should be made by the Americans.

In measuring the tail the continental Europeans use an inaccurate method. A rule is inserted under the under tail coverts—surely not so precise as using the dividers. Because some continental ornithologists press out the tail along the rule, without searching for the base of the feathers, I soon learned to expect a difference of from 5–6 mm. between their measurements and mine. We might suggest that they adopt our method of measuring birds' tails from the base of the middle rectrices to the tip of the longest. That they will choose to embrace our procedure is uncertain. In any case tail measurements are of little value in helping us to determine subspecies, and especially so if we use methods which are not standardized.

As for the culmen, the varying form of birds' beaks precludes the possibility of having a single universal method of measurement. Measuring the exposed part of the culmen is usually inaccurate, inasmuch as the frontal feathers are often either missing or too readily pushed back with the dividers, thus making the exposed culmen longer. The English method of measuring the culmen from its tip back to its juncture with the skull, disregarding feathers entirely, is more precise than the method most in favor here of measuring the exposed culmen only. Such a measurement must of course be made with dividers. The term, length of culmen, for example, in a table of measurements is not sufficient to explain

the manner of attaining the result tabulated. Several standard designations, such as culmen from nostril, culmen from juncture of skull, culmen to base, would make plain the figures now found under the heading of "culmen."

Geographic distribution plus measurements certainly tell a significant story in systematic work. The less one writes about probable and possible differences and the more one can show by tables of measurements and diagrams, the more useful and intelligible are one's results. As in other branches of science, vague average measurements and general statements cannot be considered of equal value with detailed lists. This is no less true because, to some, such precise tabulations of locality, sex, and measurements are uninteresting.

My aim in this paper has been to help arouse ornithologists to establish uniformity in methods of measurements where possible and in any other cases to describe the manner in which the measurement was taken.

Amer. Mus. Nat. Hist., N. Y. City.

BIRD BANDING AND BIRD MIGRATION WORK AT ROSSITTEN ON THE BALTIC SEA.

BY THEODOR G. AHRENS.

I. FOUNDATION, HISTORY AND OBJECTS OF THE STATION.

I. AT THE annual meeting of the German Ornithological Society (Deutsche Ornithologische Gesellschaft) in October 1900 in Leipzig, which was at the same time its fiftieth anniversary, Professor Thienemann made an address in which he demonstrated the great importance of the narrow peninsula known as the 'Kurische Nehrung' in East Prussia for the observation of bird migration. He described, how annually in the spring and autumn the Nehrung is traversed by countless thousands of birds on their migration. He then suggested that a bird station for the observation of the mysteries connected with bird migration should be founded at Rossitten. The Kurische Nehrung is 97 km. long from Kranz on the peninsula of Samland, to Memel, at which point it is cut

through, and the waters of the Kurisches Haff, the large lagoon lying between the Nehrung and the mainland, find an outlet to the Baltic. The Nehrung varies in width from $\frac{1}{2}$ to 3 or $3\frac{1}{2}$ kilometers and consists of dunes and occasional forests. Quite a number of moose are found here, the forests furnishing a safe cover and rigid protection being enforced.

The village of Rossitten is about 35 km. from Kranz and is built on one of the wider portions of the Nehrung. It was chosen for the station, as the birds in their migrations are accustomed to cross the Nehrung some 7 km. south of Rossitten. The German Ornithological Society took up Thienemann's suggestion with enthusiasm, the Prussian government promised aid and on January 1, 1901, the station was opened. Thienemann was made director and has continued in this position ever since.

In 1907 the State provided a small building for the station, containing a laboratory and a museum of birds collected on the Nehrung—till then only provisional quarters had existed. In 1908, a small house was erected at Ulmenhorst some 7 km. south of Rossitten at the point where the birds cross the Nehrung. This special observatory was destroyed by communists after the war, but it is being rebuilt and will be ready for occupancy this fall. In 1920, the Emperor William Foundation for the Promotion of Scientific Research purchased a large building at Rossitten, the present station, and presented it to the German Ornithological Society for its purposes. In it the large amount of material collected is set up and suitable laboratories furnished for visiting ornithologists, etc. The ever increasing number of visitors to Rossitten and the great general interest aroused in the public at large by the work conducted there, decided Professor Thienemann to introduce courses of instruction which are open to all and are generally held in May. These courses enjoy great popularity and consist in thorough instruction in methods of practical bird protection, particularly in those of Freiherr von Berlepsch, and also in a study of the habits of domestic wild birds. Artificial bird nests, suitable places for feeding the birds in winter and a bird thicket which has been planted in the neighborhood demonstrate the methods discussed in the courses, and the participants are taken upon excursions, where they can study the flight, the songs and other habits of the birds.

The scientific activities of the Station are concerned according to statute with the following matters:

1. General observation of bird migration and in particular of (a) the periods of the year and times of day of the migration of the individual species; (b) the direction taken; (c) the numbers of birds in the different groups and their general composition; (d) the subdivisions of the species in the migrating groups, according to age and sex; (e) weather and wind conditions during the migration, before and after them and the presumable influence of these factors upon the migration; (f) the height above ground taken by the birds; (g) Their speed during migration and experiments upon the speed of birds in general; (h) The rest stations of the migratory birds and their return; (i) the places of origin of the migratory birds.

2. Observation of bird habits and their dependence upon food conditions. Variations in the habits of breeding birds, birds of passage and migratory birds.

3. Examination of molting, coloration, and plumages of the birds in different ages and periods of the year, times for these changes and their commencement.

4. Investigations of the economic value of the birds and, in particular of (a) the food of the birds at different times and places; (b) of the benefits and damage to agriculture and silviculture, horticulture and pisciculture to be derived from the feeding habits of individual bird species. (c) distribution of plants and lower animal life, brought about by birds.

5. Investigations of practical methods of bird protection, as (a) conservation and increase of bird life by the planting of suitable undergrowth and the location of artificial nests; (b) experiments in the conservation of bird life with the aid of suitable methods of winter feeding, special attention being paid to game birds; (c) proposals for obtaining legal regulations to protect bird life.

6. Foundation and continuation of a collection of the birds, indigenous to or living on the Nehrung, or its vicinity in the museum of Rossitten.

7. Procuring laboratory specimens for scientific institutions.

8. Endeavors to spread the knowledge of domestic wild bird life in general and its economic value—particularly by means of lectures and literature.

9. Out of the above propositions has grown and been developed, chiefly through Thienemann's efforts, the banding of migratory birds which has not only served to answer many of the questions propounded, but has increased the acquaintance with bird life and migration to a very great extent, making the Rossitten bird station known all over the world.

II. DESCRIPTION OF ROSSITTEN, THE STATION AND ENVIRONMENT, BASED UPON A PERSONAL VISIT THERE IN AUGUST 1922.

II. I made a visit to Rossitten in the summer of 1922, and spent four days on the *Nehrung* in company with Dr. Procházka, a Tschech ornithologist from Prague. Rossitten is a primitive fishing village and is reached by steamboat from *Kranz* every other day, during the summer months in about two hours. Professor Thienemann has a little wooden house with a fine library and many interesting things collected by him from time to time. The house occupied by the Bird Station is a large commodious dwelling with the Museum, containing a very notable collection of birds indigenous to the neighborhood and stray specimens shot and captured at one time or other. For instance, two parrots (possibly escaped cage birds from some vessel), maps with the routes taken by different birds, collections of bands used here and at other stations, and relics, consisting of bird legs with the bands still attached, sent from South Africa, Barbados and various remote places, newspaper articles, letters, etc., referring to birds banded at Rossitten and reported upon.

Professor Thienemann is a man about 50 years of age, and looks younger. He is erect and alert, has a most winning personality, full of enthusiasm and a prodigious capacity for work. He has a home in Königsberg, where he has a nominal position connected with the Department of Zoology at the University, but his whole life and energies are devoted to Rossitten. This year he had his sister as a regular assistant. She traced bird migration routes on the maps, and looked after the Museum during visitors' hours. Thienemann goes to the observation station at *Ulmendorst* towards the end of September and stays there till the end of the migration period. There he notes down his observations of speed, numbers

of birds and any new phenomena he may observe. He personally superintends the banding operations which, in the great majority of cases, are carried out in the spring and early summer, nestlings being generally selected. He also took us to the observation station at Ulmenhorst, some 7 km. southwards, where a new house is being built for the observation of migration. It will contain sleeping quarters, laboratories for visitors who wish to observe the migrations, etc. This point is most interesting. On one side you have the Baltic, on the other vast wander dunes, and beyond the waters of the Haff, so wide that the mainland coast cannot be seen. To the north the forest, to the south dunes and desert. At this point the swarms of migrating birds cross, and here the observations of speed, height, etc. are made. We saw frequent tracks of moose made only a few hours before, but moose themselves did not appear. The wander dunes are a most interesting phenomenon. About 1756, the Russians who had occupied the Nehrung deforested the whole peninsula. In consequence the sand drifted from the Baltic side eastward and formed great dunes, engulfing in the course of time several viallges. These dunes move from 8-10 m. eastwards annually and as they are now secured by plantations and other methods, and do not increase, it is estimated that in about 100 years they will have entirely disappeared in the waters of the Haff.

III. REMARKS UPON BIRD MIGRATION, AS OBSERVED AT ROSSITTEN, AND THE PROBLEMS CONNECTED WITH IT.

III. As regards the results of the observation of bird migration at Rossitten, we have stated that the most favorable position for observation is not Rossitten, but a point 7 km. south of it, where the forest which covers the central portion of the Nehrung ceases and treeless sand dunes are found for many miles. At this point the Nehrung is so narrow that the whole width of the peninsula can be overlooked from the Baltic coast to the banks of the Haff (the lagoon between the Nehrung and mainland). At this point high wander dunes are situated.

As an example I give a short description of observations made on a good migration day in October. As soon as the day breaks the

first flocks of Crows make their appearance, larger and larger swarms of these birds succeeding one another in long chains. Shortly after, flocks of Wild Pigeons and swarms of Starlings (*Sturnus vulgaris*) at high speed and making a great noise with their wings. *Lullula arborea* (Heidelerchen, Wood Lark), in small flocks, larger groups, again, of *Fringilla coelebs* (Buchfinken, Chaffinch), and of *Acanthis linaria holbolii* (Leinzeisig, Holboll's Redpoll).—These smaller birds frequently descend and take a brief rest on the bushes and trees in the neighborhood. Varieties of Thrushes (*Turdus*) pass overhead; Geese in wedge formation, Cranes and Wild Swan. Among all these birds now and then birds of prey appear. *Buteo buteo* (Mause bussard, Common Buzzard), *Archibuteo lagopus* (Rauhfußbussard, Rough-legged Buzzard), *Accipiter nisus* (Sperber, Sparrow Hawk), *Falco peregrinus* (Wanderfalke, Peregrine Falcon), *Falco regulus* (Merlin) and once in a while, perhaps, a *Haliaeetus albicilla* (Seeadler, White-tailed Eagle). The migratory instinct causes these mutual enemies to fly together peacefully. Great numbers of *Regulus regulus* (Goldhähnchen, Golden-crested Wren), *Erithacus rubecula* (Rotkeleken, Red-breast) hop around from bush to bush, for these smaller birds do not keep up a steady flight. In the above manner the migratory flight continues uninterruptedly, till about noon and then gradually ceases. Such good days as just described, are rather rare at Rossitten, but still occur during every migration period. On October 10, 1912, for instance, no less than 26 species were observed and at least 29,000 birds flew across the Nehrung. A problem that has much occupied Rossitten is how the birds migrate, i.e., old birds and young together, male and female together or separately. If, for instance, old and young birds traveled together, the experience of the old ones would aid the young ones during flight. In *Fringilla coelebs*, for instance, the sexes migrate separately. Cases are known, however in which the young birds fly alone and are thus unable to have a leader, and must be guided by instinct exclusively.

Observations seem to prove that the young of the following species precede the older birds when migrating. *Totanus glareola*, *Circus macrurus*, *Cerchneis vespertina* (Kestrel) and *tinnunculus*.

Another interesting problem is that of the height above ground, taken by the migrating birds. Altitudes of 5000 to 6000 meters had been formerly considered possible, but apart from the scientific improbability of these heights (cold, adverse air currents, etc.) observations made continuously and accurately have shown that in general a height of 100 meters is the rule. Crows, Starlings and birds of prey rise to greater heights in quiet weather, but even then only a few hundred meters, so that the characteristic silhouettes of their spreading wings may be clearly distinguished.

The speed of birds during migration has also been much overestimated. At Ulmenhorst, the place of observation, the following rates of speed, based upon experiments, have been accurately noted :

1. <i>Sturnus vulgaris</i> , Starling	20.6 m. per sec.
2. <i>Coloeus monedula</i> (Dohle,) Jackdaw	17.1 m. " "
3. <i>Loxia curvirostra</i> (Kreuzschnabel,) Crossbill	16.6 m. " "
4. <i>Falco peregrinus</i> , Peregrine Falcon,	16.45 m. " "
5. <i>Chrysomitris spinus</i> (Zeisig,) Siskin,	15.5 m. " "
6. <i>Fringilla coelebs</i> , Chaffinch,	14.6 m. " "
7. <i>Corvus frugilegus</i> , Rook,	14.5 m. " "
8. <i>Corvus cornix</i> , Hooded Crow,	13.9 m. " "
9. <i>Larus fuscus</i> , Lesser Black-back Gull,	13.8 m. " "
10. <i>Accipiter nisus</i> , Sparrow Hawk,	11.5 m. " "

IV. THE BANDING OF BIRDS AS PRACTISED AT ROSSITTEN AND SOME OF ITS PRACTICAL RESULTS.

IV. Although bird banding in a desultory manner had been practised for some years previous, the first man to take up the matter systematically and scientifically was the Danish college Professor Mortensen, who began in 1899 with Starlings, Storks, Ducks and sea birds. Thienemann took up banding in 1903 and has made it the chief object of his work at Rossitten. By frequent articles, published everywhere he endeavored to bring the importance of banding, and reporting upon banded birds before the general public. By means of banding, regular reliable maps of the routes taken by Storks, *Larus ridibundus*, *Corvus cornix* and others have been made.

Seven different-sized aluminum bands are used at Rossitten with the letters running from A to G to denote the sizes. The bands are numbered continuously, according to series, marked with their respective letter and have the words *Bird Station, Rossitten, Germany*, for the large bands and only *Rossitten* for the smaller. The bands are used as follows:

Series A: Halieetus albicilla (Seeadler), White-tailed Eagle.

Aquila chrysaetos (Steinadler).

Otis tarda (Trappe), Bustard.

Grus grus (Kranich), Crane.

Series B: Ciconia ciconia (stork).

Ardea cinerea (Fischreiher), Heron.

Botaurus stellaris (Rohrdommel), Bittern.

Phalacrocorax carbo (Kormoran), Cormorant.

Anseridae,

Pandion haliaetus (Fischadler), Osprey.

Aquila clanga (Schreiadler), Spotted Eagle.

Series C: Astur palumbarius (Habicht), Goshawk.

Falco peregrinus (Wanderfalke), Peregrine Falcon.

Milvus ater (Milan), Black Kite.

Buteo buteo (Bussard), Buzzard.

Corvus corax (Kohlrabe), Raven.

Anas boschas (Stockente), Mallard.

Colymbus cristatus (Haubentaucher), Great Crested Grebe.

Series D: Circus pygargus (Rohrweibe).

Phasianus colchicus (Fasan) (English Pheasant).

Corvidae

Series E: Accipiter nisus (Sperber), Sparrow Hawk.

Cerchneis tinnunculus (Tarmfalke), Kestrel.

Lycos monedula (Dohle), Rook.

Cuculus canorus (Kuckuck), Cuckoo.

Limosa ——— (Schnepfe).

Larus ridibundus, Black-hooded Gull.

Series F: Turdus Thrushes, Starlings, Picidae, Woodpeckers.

Regenpfeifer, Strandlaufer (*Tringa*), Sandpipers.

Charadriidae, Plovers.

Series G: Small birds.

V. ROUTES TAKEN BY EUROPEAN BIRDS WHEN MIGRATING.

V. As regards the routes taken by birds some of the most interesting results should be stated. The Common Stork (*Ciconia ciconia*) has winter quarters in South Africa in the region of the East African Lakes, Kalahari Desert, Rhodesia, Transvaal, Orange Free State, Cape Colony. The distance from Northern Europe where the Storks pass the summer is some 10,000 km. and instead of taking a direct route, observations made by banding have shown that two main (roundabout) routes are taken.

1. A southeastern route via Hungary, Balkan countries, Bosphorus and Dardanelles to Asia Minor and thence through Syria to Egypt and via the Nile to Central and South Africa.

2. A southwestern route via France, Spain, Gibraltar to Morocco, thence across the Sahara using oases as resting places. Both of these routes are land routes, showing that the Stork dislikes a flight across the Mediterranean.

Larus ridibundus which breeds along the coasts of the North Sea and Baltic wanders along the coast westward to the British Channel, or continues along the coasts of France and Spain to North Africa; others go down the Rhine and Rhone valleys and spend the winter in the western Mediterranean countries. Lyons and its neighborhood is a region largely visited by Baltic gulls.

Before the war notices of banded birds seen or shot there were frequently sent to Rossitten. Gulls banded at Rossitten have been picked up in the Gulf of Mexico, Feb. 1912, and on the island of Barbados, November, 1911. Snipe from North Russia go along the coast to England, or southwesterly through Germany to south France, Spain, Italy, Sardinia, Corsica and Africa. In the main the following general migratory routes for European birds have been determined, based upon banding records.

1. A western coast route—from east to west along the Baltic and North Sea to England, the north coast of France, the west coast of France to Spain and North Africa. This route is taken notably by Gulls and Terns; Scolopacidae, (*Tringa*, *Gallinago*, *Scolopax*); Oyster Catcher; Lapwing, Ducks; Cranes; Crows; Starlings; and Thrushes.

2. An Adriatic-Tunisian route, along the coasts of the Adriatic, Sicily to Tunis. By Laridae (*Larus ridibundus*); Scolopacidae; Gruidae; many small song birds.

3. An Italian-Spanish route from Austria-Hungary via North Italy, Po Valley to Corsica, Sardinia, Balearic Islands to South France and Spain: By Laridae; Charadriidae; Scolopacidae, etc.

From 1903-1919, 7,778 birds were banded at Rossitten and, besides 123,569 bands were distributed to outsiders. Of these 7,778 banded birds, 2,011 have been accounted for by reports received at the station. Observations now extending over 19 years have proved conclusively, that banding is not injurious to the birds and that it does not disturb or change their habits. All attacks made upon science by over-conscientious bird protectors have been disproven as based either upon misapprehension or upon wilful misrepresentation.

Berlin, Germany

THE CONNECTICUT VALLEY—A HIGHWAY FOR BIRD MIGRATION.¹

BY AARON C. BAGG.

Plates. XVI-XVII

TRAILS are perpetually fascinating. From the dawn of history the wanderings of men and later, certain of their trade routes continually attract our attention. Just how a group became established in a given locality; by what route various hordes poured over a mountain-barrier or across a body of water; why another tribe did not remain settled or stationary but persisted in continual travel—all these are problems which the student of history likes to puzzle over. So in the study of ornithology the routes traversed by birds of passage equally charm the student or the layman. Long before white men braved the mad Atlantic to explore a new world or the warriors of the Six Nations established the new

¹ Paper read before the Allen Bird Club of Springfield, Mass., Feb. 6, 1922. My grateful acknowledgments are due Mr. J. A. Farley for his painstaking revision of this paper and for a number of contributions in data. A. C. B.

famous Mohawk Trail into the Connecticut Valley; yes, prior to the time that the Abenakis first descended the Valley from Memphremagog and the headwaters of the river to its mouth for their winter's supply of pemmican, this Valley, like others, was used for centuries, if not ages, by the birds in their annual spring invasion and autumn exodus. The origin and cause of this habit of regular advance and retreat was always in the past an unsolved mystery. Consensus of opinion today, however, points to the Great Ice-Sheet, or better to the decline of the age of Ice, as being largely instrumental in bringing about this remarkable and regular phenomenon. Bird migration is now authoritatively considered to have begun by only short changes of location, corresponding to the first slight recessions of the ice cap from which must have come benefit in some form. So migration became gradually a habit; and more gradually still, the range lengthened with the shrinkage of the ice-sheet until the present migration routes have resulted from what the late W. W. Cooke of the Biological Survey calls: "the innumerable experiments as to the best way to travel from the winter to the summer home and return." The three chief routes of North American bird migration are the eastern and the western coastal plains, and that great jugular vein of our continent, the "Father of Waters." The Atlantic coast-line is a "short-cut" to the greatest breeding ground of the continent. Crossing or encircling the Gulf of Mexico, the main northward flight follows the seaboard as far as Long Island. Here a triple division occurs; one group of birds sweeps up the Hudson, another crosses the Sound and ascends the Connecticut Valley, while the remainder continues on up the coast. It is with the second of these routes that our subject deals.

The Connecticut River, rising near the watershed dividing Canada from northern New Hampshire and running for much of its length in a general southerly direction, furnishes the most direct and easily followed route for birds into eastern Canada. The river including the lakes, extends 360 miles to the sea, and is thus the principal waterway of New England. Its old Indian name means "Long River." As the bird flies, the route would probably be close to 300 miles. A natural basin among heavily wooded hills and mountains of the ancient Appalachian system gives birth

to this famous river. Dashing mountain streams in the northernmost corner of New Hampshire and less than one-half mile from the Canadian border, converge into Fourth Lake, a limpid mountain-pool, the uppermost of the quartet known as the Connecticut Lakes. It covers but a few square acres at an altitude of nearly 2500 feet, and is within a few score feet of the summit of Mt. Prospect. Still within half a mile of the border the outlet of Fourth Lake enters Third Lake at an altitude somewhat over 2000 feet. This lake has an area of three-fourths of a square mile and like the Fourth Lake is set in a dense mixed forest, made up for the most part of small spruce and fir. Second Lake is reached six and one-half miles below Third Lake by means of a fair-sized stream, which having gone five miles is joined by a stream equal in size, coming in another direction from the Canadian border. The Lakes increase in size and decrease in altitude as we proceed. Second Lake is two and three-fourths miles long by a mile or more wide at one point, and is more than a thousand feet lower than Third Lake. Four miles further south and the First or "Connecticut Lake" is reached, the largest of all and the body of water from which our river directly flows. This Lake is 1680 feet above sea-level, covers nearly three square miles and measures four miles long by two and three-fourths miles in extreme width. The surrounding hills are covered with deciduous trees, sprinkled here and there with evergreen; but the fields adjoining the Lake and for a considerable distance back have long since been cleared and summer cottages are becoming more and more numerous. Regarding this country, Mr. Charles L. Whittle, the geologist, after visiting the Lake region in 1918 says: "In the matter of the general character of the country outside the zones surrounding the Connecticut Lakes, I will state that with the exception of a few square miles of farming land about First Lake and stretching southwest to Canaan, Vermont, along the roads, the entire country is an unbroken wilderness covered in the main by a virgin forest of deciduous trees from which nearly all the conifers have been removed by the lumberman."

With a rapid, sizable current the river leaves Connecticut Lake and continues swiftly for two or three miles with an average width of 90 feet. Several other streams meantime contribute their quotas.

Eighteen miles from First Lake the river comes to the dividing line of Canada, New Hampshire and Vermont and in this distance descends 583 feet. It is now 1035 feet above sea-level. For the next 50 miles the drop is but 204 feet. Toward the end of this lap the proximity of the White Mountains pushes the river twenty miles to the west to where it joins the Passumpsic river, a good-sized tributary coming down from the region of Willoughby lake to the north in Vermont. From this junction to the Massachusetts line it is 118 miles as the crow flies and 137 miles following the course of the river. The descent is about two feet per mile. The Valley takes on now its characteristic appearance of a series of terraces. In the river bottom the rich soils nourish the prosperous farms all the way along, and with each successive terrace, sometimes five in number, fertility gives place to outcrops of various rock-formations or to remnants of ancient flood-plains which the glacial river overflowed each year. The highest terrace may rise as much as 200 feet, above the river. Where the Valley is narrow, as for much of its length on the line of cleavage between New Hampshire and Vermont, the terraces rise close and steep; for the river is not as yet the broad tortuous current that it becomes through Massachusetts and much of Connecticut. Contributing streams enter all along the way and here and there mountain peaks stand guard. East of Haverhill, New Hampshire, towers Moosilauke, 4790 feet above the sea, the outpost of the southwest extension of the White Mountains. Not far to the south in Orford is Mt. Cube, 2927 feet above the sea, while farther down on the Vermont side lies Mt. Ascutney 3168 feet, the highest elevation lying wholly within the Valley. At White River Junction enters White River the largest stream in Vermont east of the Green Mountains, while in the next twenty-five miles a half-dozen more tributaries join. Again the hills converge and hem in the river until at Bellows Falls it becomes a foaming torrent, the steep hills on either side rising to 1200 feet above sea-level. During the seventeen-mile run to Brattleboro, Vt., the river again broadens out and becomes placid and two tributaries join. Twenty miles away on the eastern edge of the Valley, Monadnock lifts his head to a height of more than 3000 feet. The Ashuelot, last of the New Hampshire rivers, enters the Connecticut within four miles of the Massachusetts

border. At this junction the river has already come 208 miles with a descent of 1412 feet, but is yet 206 feet above the sea and has 152 miles to go before entering Long Island Sound. Its total length in New Hampshire following all bends and turns is approximately 236 miles, but as the bird flies it is not more than two hundred miles.

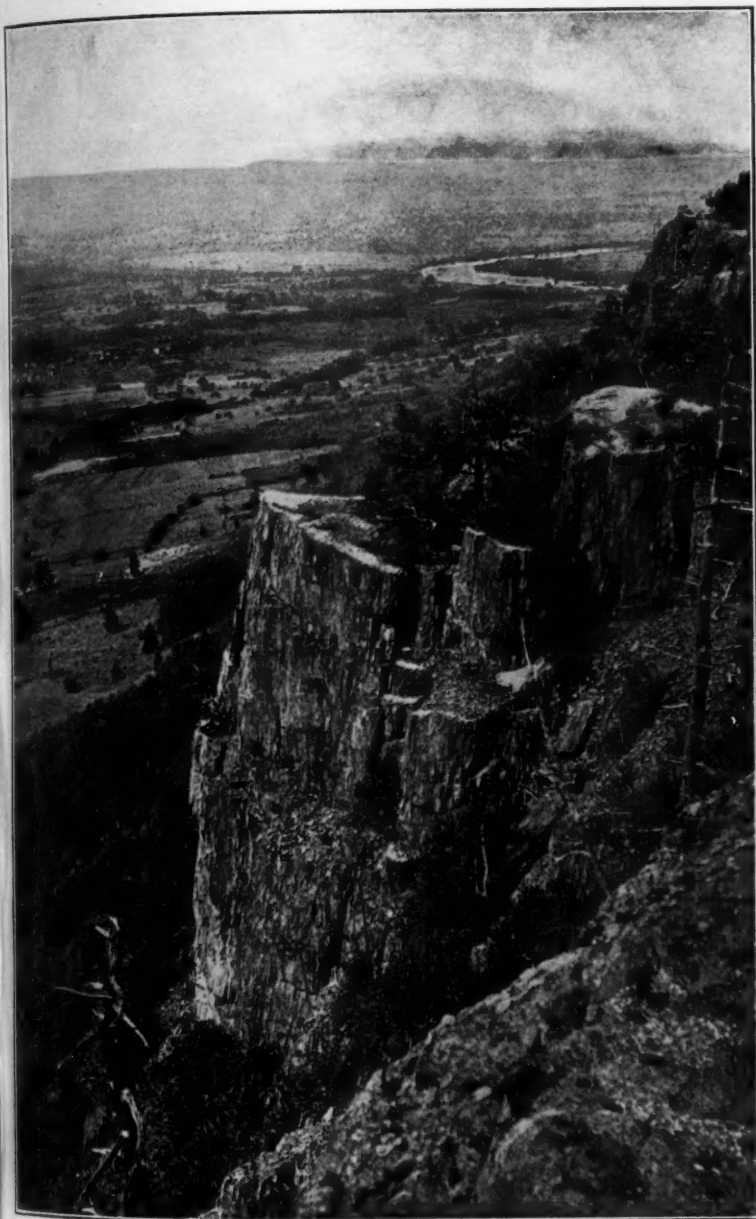
Across the fifty-mile extent of Massachusetts the Valley varies in width, but averages about twenty miles. At the southern end, as at the north, it narrows between fringing hills. Miller's River, first of Massachusetts tributaries, enters from the northeast not far from Greenfield. West of here a group of hills appear which, turning southward, enter the Valley, extend along its center and twice cross the river as the Mt. Toby and Mt. Holyoke Ranges. A unique combination of ranges, hills and terraces, together with a great area of fertile fields through which the river meanders, sometimes even forming ox-bows, gives the Valley through Massachusetts its unequalled charm. Near Greenfield two other streams enter the main current. The Deerfield River by way of a considerable valley flows from the Green Mountains, while the Falls River, a smaller tributary, comes down from the north. In South Deerfield, the Deerfield chain of hills ends in a sandstone bluff, "Sugarloaf" by name, which overlooks the river; while directly opposite the group of hills forming Mt. Toby loom up. From this point the Valley widens out considerably, and the river flows on in great curves and bows, the greatest of these being the ox-bow at Northampton, opposite which lies the Mt. Holyoke Range. The river runs between this and the Mt. Tom Range. Mt. Tom itself, although but 1218 feet in height, rises head and shoulders above the surrounding country so that for long distances it can readily be seen up and down the Valley, particularly on a clear day or at night when its beacon-light shines. For the next fifty-three miles, or as far as Middletown, Conn., the Valley varies in width from three to ten miles. The river averages 1200 feet in width as far as the Connecticut State Line, and it reaches its maximum breadth at Longmeadow where for a mile it spreads to 2100 feet. On the east bank, along half of this mile, grows a wild rice, planted about 1880 by Robert O. Morris, Springfield's veteran ornithologist.

Just below the Connecticut State Line the river runs over a rocky bed for five and one-half miles to Windsor Locks, where because of rapids it seldom, if ever, entirely freezes in winter, particularly where the railroad crosses. For the next ten miles to Hartford the river again slows down, gains depth and averages 1500 feet in width, running in a comparatively straight course due south. From this point where a daily tide of two feet is registered, it becomes irregular again. During this interval several streams join forces with the main current. The chief of these is the Tunxis or Farmington River, which gains access to the Valley through its western ridge here known as the Talcott Range. From Hartford to Portland, where it is a half-mile wide, the Connecticut presents the curious phenomenon of a constantly changing course. Six miles below Hartford, for instance, in a little more than a decade, it has moved its entire width eastward. At Middletown there remains but thirty-eight miles to the end of the long run. The hills now rapidly close in until for about the distance of a mile, known as the "Straits," only forty rods separate shore from shore. In the short distance to the sea it broadens for the last time and enters the Sound at Saybrook with quite a wide mouth. "Thus does the Long River," according to Oliver Wendell Holmes, "loiter down like a great lord, swallowing up the small proprietary rivulets very quietly as it goes." To sum up: The Valley's eastern and western boundaries are the mountains of the Appalachian system, some in greater, but more in lesser height. Between the two main ranges of this system the watershed reaches a maximum of nearly fifty miles. The River by means of more than twenty tributaries, drains about three-tenths of New Hampshire and four-tenths of Vermont, or a total of 6900 square miles in both States and 11,300 square miles in its entire area. On the other side of these northern ranges rise rivers flowing directly into Canada and northern New England. With such directness, with so many prominent landmarks, with an unequaled number of connecting tributaries, does the Valley appeal to the birds of passage and become the highway that it is to the northern network of routes. The highlands of western Connecticut and Massachusetts including the Berkshire and Hampshire hills, the Green Mountains, the White Mountains, western and

northern New England, eastern Canada and the Provinces—all are directly linked up with this great Valley.

Three life zones are represented in the Valley. At the southern extremity the Carolinian fauna of the upper Austral zone after coming eastward from New York along the Sound shore line, extends north as far as Hartford. More specifically it approximates the Massachusetts State Line, although certain species seldom, if ever, occur in the Valley north of the Connecticut capital, such for instance as the Carolina Wren, Blue-winged, Hooded and Kentucky Warblers, Tufted Titmouse and Blue-gray Gnatcatcher. On the other hand such representatives of this zone as wander north either occasionally or else in small numbers into the Valley in Massachusetts are the Fish Crow, White-eyed Vireo, Orchard Oriole, Cardinal, Chat, Mockingbird and Golden-winged, Prothonotary, Worm-eating and Prairie Warblers. A notable southern bird that has occurred in Springfield is the Blue Grosbeak, which was seen by various observers including the writer on May 11, 12 and 13, 1922. Recently it has been established that the Rough-winged Swallow, while it is well known to be more or less a breeder in western Massachusetts, ascends into New Hampshire to nest. Portland, Conn., seems to be the dividing line in the Valley of the Purple and the Bronzed Grackles, as the former rarely wanders farther north. Intermediates are found in the vicinity. From the Connecticut line well into the valleys of the Green and White Mountains, birds of the Transition zone are found. Most of our common birds come in this group. Just as this section of the Valley, particularly in Massachusetts, is the mecca of geologists, so it is important ornithologically, not only as a highway but because it has been made famous for generations by the breeding of Duck Hawks. Year after year on such cliff-sided summits as Talcott Mountain near Hartford, Mts. Tom, Holyoke and Sugarloaf, and others farther north, *Falco peregrinus anatum* has nested. Most noted of these is the Mt. Tom eyrie fully described by Dr. J. A. Allen who published in November, 1864, the first authentic description of the nesting and eggs of the American Peregrine Falcon.¹ In the early

¹ Proceedings Essex Institute, volume IV, page 153.



THE CONNECTICUT VALLEY.

View from west side of Mt. Tom Range, looking north, showing west bend of Ox Bow. This is the cliff of the Duck Hawk eyrie.

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summer of 1921, R. L. Coffin of Amherst located in this section of the Connecticut Valley five of these nests with either eggs or young. Where the more northern climate and higher altitude are encountered, where spruce and fir supplant white-oak and chestnut, birds of the Canadian zone may be looked for. In addition to the region roundabout the Connecticut Lakes, such peaks as Ascutney, Moosilauke and Monadnock may be called isolated zones of Canadian faunal life; at least their summits may. Here one will find nesting the Golden-crowned Kinglet, Red-breasted Nuthatch and Myrtle Warbler. Moosilauke is famous for its nesting haunts of Bicknell's Thrush. This bird as well as the more northern breeding Warblers, the Hudsonian Chickadee, Philadelphia Vireo, Pine Grosbeak, Crossbills, Canada Jay and Spruce Partridge, are found nesting in the vicinity of the Canadian Lakes, rarely farther to the south. During the winter, such northern birds as Three-toed Woodpeckers, Snow Buntings, Redpolls, Tree Sparrows, Acadian Chickadees, Pine Grosbeaks, Crossbills, Goshawks, Rough-legged Hawks and Snowy Owls descend the Valley in search of food, often well into Connecticut and sometimes beyond. Several decades ago large incursions of Rough-legged Hawks occurred. Sixty were taken in one winter on the Hadley meadows in the vicinity of Mt. Holyoke—most of which were mounted for different museums. In another winter forty were collected near East Windsor Hill, Connecticut. The Northampton and Hadley meadows proved formerly a great attraction likewise for Short-eared Owls. Mr. Morris reports that during the eighties, colonies of them were found there in winter. Mr. Edward O. Damon of Northampton once encountered a flight which he estimated to be at least one hundred birds which were flying low down in the twilight. The only record we have of the Gyr Falcon is of one taken by Mr. Damon many years ago in this vicinity. Dr. J. A. Allen records a Raven taken in 1859, at Springfield. With the cutting off of more and more timber such rare birds are in late years seldom, if ever, observed even in the northernmost part of the Valley.

Two species that originally were a common sight when the settlers first came to the Valley are now extinct, namely, the Wild Turkey and the Passenger Pigeon—chiefly because they formed so

large a part of the people's food. Talcott Mountain had Wild Turkeys during the early part of the nineteenth century; but the Mt. Tom and Mt. Holyoke Ranges seem to have afforded the best protection to the species in the Valley for it was here in the early fifties that the last Turkey was captured. Passenger Pigeons, when the flights were on, came in an unending procession to and from the large forests to the north and west. They were abundant until the seventies when their ranks began to thin out, and the last Pigeons were observed in the spring of 1884 at Southwick Ponds and in the spring and fall of 1887, at Portland, Connecticut. John H. Sage shot a young male October 1, 1889, at Portland, which constitutes the last Valley record so far as we are aware. Two other species the Purple Martin and the Dickcissel, while not extinct, might as well be so far as our Valley is concerned. Nesting abundantly in former years throughout most of its length, but a few scattering Purple Martin colonies remain today. As with the Wild Pigeons, the Martins began to decrease in the eighties, largely due to the rapid increase of the English Sparrows, which drove them from their nesting places. A few colonies were breeding in 1912, in Portland and Middletown, but it seems only a question of time when we shall no longer number these attractive Swallows among the migrants of the Valley. Prior to 1840 the Dickcissel was a common bird in summer in the Valley. Dr. J. A. Allen records one taken in May 1866, in Holyoke, which seems to be the last authentic record.

But noted as the Valley is in these physical and faunal aspects, it is primarily famous as a pathway for migration. Every month of the year witnesses flights of various bands or flocks of birds; at times there may be but a few stragglers or only a solitary stranger. Even in the interim, before the spring and the autumn migrations, birds are moving to and fro; indeed it is difficult usually to tell when one migration leaves off and the other begins. Nor do the cold days and nights of winter, supposedly birdless, drive all bird-life from the Valley. Particularly is this true the nearer the river reaches the Sound. During most winters many birds remain in the vicinity of Saybrook and other shore towns waiting to ascend the river with the first signs of spring. For the most part such wintering birds are Grebes, Loons, Mergansers, Golden-

eyed and Black Ducks, Canada Geese, Great Blue Herons, Mourning Doves, Red-tailed, Red-shouldered, Rough-legged, Marsh and Duck Hawks, Kingfishers, Flickers, Cowbirds, Blackbirds, Meadowlarks, Vesper, Fox, White-throated, Song and Swamp Sparrows, Juncos, Cedar Waxwings, Myrtle Warblers, Pipits, Catbirds, Winter Wrens, Hermit Thrushes and Robins. All through the winter whenever there is open water, Herring Gulls may be seen flying above the river as far north as Holyoke; while Mergansers and Golden-eyed Ducks ascend the river at times to northern Vermont. In the bitter winter of 1918-1919, when a little open water still persisted in the Connecticut, at Newbury, Vt., where Wells River comes in, a few of the rare Barrow's Golden-eyes flocked with a larger number of the common species.

In early spring one might well compare the oncoming birds to the column in a thermometer. With the incessant change of New England weather the vanguard advance and retreat at first much as does the quicksilver. Birds that have bred for several seasons in a particular spot seem most anxious to escape the inactivity of the long winter months and to return to household duties again. Bluebirds are quick to return to the old nest and use the Valley in large numbers. I have in mind, likewise, a Phoebe that nested each year over the front piazza doorway of a South Deerfield farmhouse, the owner of which sometimes reported the return of his Phoebe in the spring as much as a week before one had been seen or reported in either Springfield or Holyoke. Northern nesting Robins are similarly anxious to be the initial claimants for the "early worm." With the advent of a warm wave Robins by the score will appear in the Valley and push rapidly northward. Then, next day, with the veering of the wind, the Valley may be once more in the grip of winter. Snow or sleet with much wind descends and sends the eager birds to cover. Hundreds and sometimes thousands of Robins may be seen now in large flocks either retreating down the Valley or scurrying back from the hill-country. Such storms bring about a retrograde movement, a good example of which occurred in the first day or two of April, 1919, when large numbers of Redpolls, Siskins and Robins drifted down the Valley before the storms. At Hatfield an observer

stated that Robins by thousands were taking refuge in the long stubble and grass of the fields. When starting up in simultaneous flight, they presented a tremendous array. In the vicinity of Holyoke, with the storm, came numbers of Tree and Fox Sparrows and Juncos—birds whose ranks were beginning to thin out—while Bluebirds, Red-winged Blackbirds and Grackles largely disappeared in retreat but put in appearance promptly again on April 3rd when the snow and ice had melted. A like movement of even greater proportions occurred with the severe storm of the last day of March, 1922. Seven or eight days of warm weather brought the early birds in considerable force, many of them ascending the Valley into Vermont. The unexpected snow storm caught them unawares; and with it unabated on the second day, retreat was their only salvation. Juncos by the hundreds, Fox and Song Sparrows and Robins by dozens were now to be found in the vicinity of Mt. Tom. Hawks and Woodcock which were observed a week before making their way northward could now be seen going in the opposite direction. Phoebe seemed sadly out of place amid the falling flakes. Something much out of the ordinary occurred near Brattleboro, when flocks of Canada Geese were observed coming back down the river where several days prior they had ascended. Yards, gardens and highways were suddenly filled with birds that we had not expected to see again till fall. Many that came to our trap proved to be in a weak, starving condition, with breast bone prominent. Birds that we had been trapping completely disappeared, and the forty birds we banded during these three days (23 Song Sparrows, 10 Juncos, 4 Tree Sparrows, 1 Fox Sparrow, 1 Chickadee and 1 Bluebird) were all newcomers. April brings more and more new arrivals. Immense flights of Sparrow bands, one after another in rapid succession, pass north during this month, filling our gardens and fields, our thickets and hedgerows. Of this procession the Juncos are in the van, many having passed the winter in the southern end of the Valley or vicinity. Like leaves before the October wind I have seen them billow past, twittering as they flew. Song Sparrows are here too, as are the Fox Sparrows, Savannah, Vesper, Field and Chipping, but especially the White-throats, with a sprinkling of the White-crowned. The real procession of passing

birds, however, may well be said to reach on the average its climax during the first half of May. Then one may well gain an idea of what an important highway the Connecticut Valley is by going afield well nigh anywhere throughout its length and breadth. In groups it may be, or in companies, singly or in immense flocks, the headlong stampede wings its way continually northward. Brightest and best of all the flying hosts are the Warblers. I recall a certain spring day not many years ago, when seated on a favorite stump, I was watching wave after wave of these sprites descend upon a clump of white birches above the western bank of the bend in the river, just north of Holyoke. In a score of minutes, I observed as many or more of the various Warblers, including the rarer Wilson's, Cape May, Tennessee and Bay-breasted. The never-to-be-forgotten week in May, 1917, readily comes to mind. A sudden turn for the cold not only held the Warblers in check but brought them to our very door-yards. Retarded likewise was all insect life and hundreds, possibly thousands, of Warblers must have perished. School children brought in many in starving condition and so feeble that they were readily captured. One farmer told of dozens of these little birds settling down all over him, his horses and load as he drew manure to his field. That same week a similar condition existed in most of the Valley as far north as Vermont. Mr. E. C. Bliss states that several carloads of manure happened to be piled in one place at South Deerfield ready for the tobacco fields. The heat from the compost brought out a small crop of insects which in turn attracted hundreds of Warblers. They completely covered the big pile measuring many cords, and had to be well nigh brushed off, so hungry and weak were they, before the men could load their carts. For most of that week a Yellow-bellied Flycatcher and several Tennessee Warblers remained in our front yard, and subsisted on barberries. Sometimes a Golden-winged Warbler, occasionally the Mourning, and rarely the Cerulean, accompany the main flight. For an entire week in May, 1921, R. L. Coffin reports that a Cerulean Warbler could be observed almost any time of day in a certain forsythia bush of a neighbor's yard in Amherst. The principal pleasure in witnessing a spring Warbler-flight is due to the fact that they usually precede the fully-developed foliage.

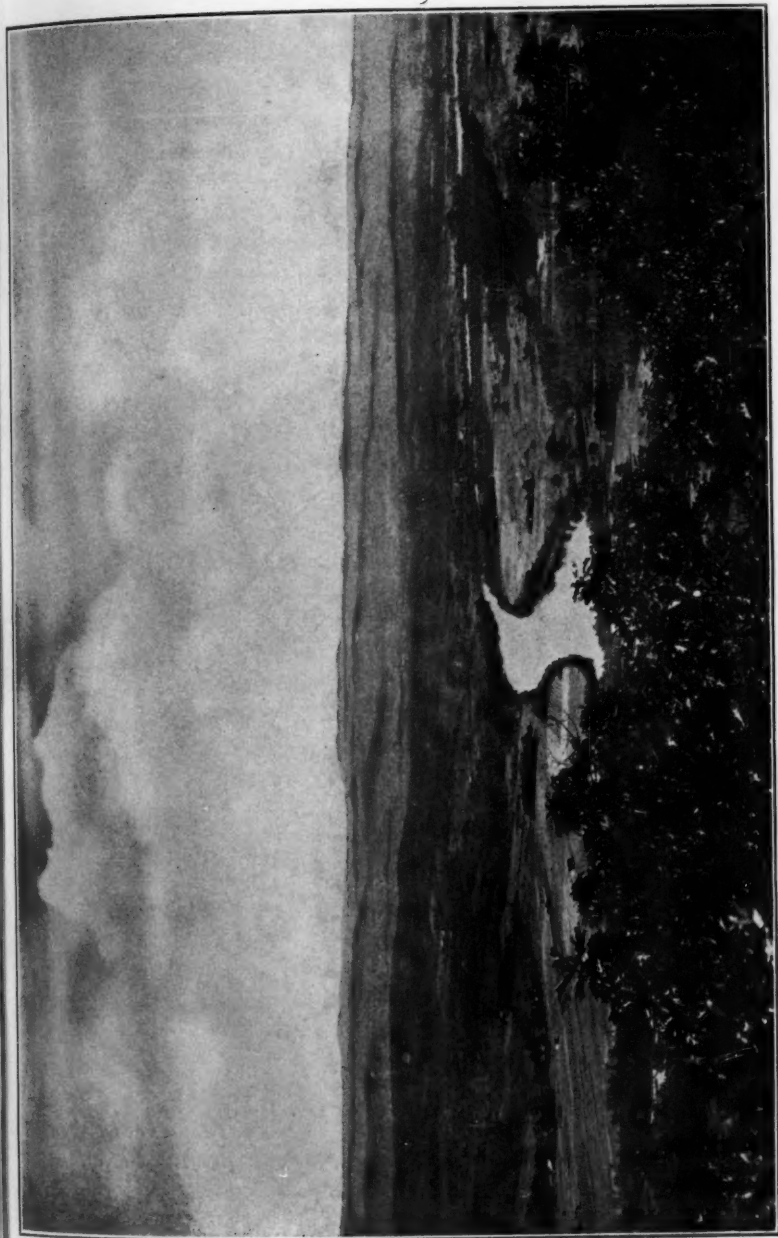
A much easier matter is it then to observe and identify the ever-moving birds and quite often to register their songs as well. May of 1921, brought a disappointment in this respect. The stage was all set for a bright pageant but no Warblers! The foliage pushed out to full bloom, and still they did not come. Finally there arrived a very hot morning when it seemed as if the birches and bush-bordered streams were deluged with birds. Not only were most of the Warblers represented but Flycatchers, Vireos and Thrushes were aplenty. Thinking we could augment the morning's list—at noon well upwards of one hundred—I visited in the afternoon Chesterfield and the hill-country. But not a Warbler anywhere; birds were extremely scarce. The Swamp Sparrow proved to be the only new bird we could locate. Obviously the flight was pouring up the Valley, but it had not penetrated the higher hill-country to the east or west. The heights were as free of birds as the Valley had been a few days before. The Warblers bring the spring migration to a dramatic climax, and when they have passed they leave one with a feeling of something lost.

With the great spring burst of bird-life; with all its song and color, all flights to the novice must seem diurnal. Many species, however, fly by night. While canoeing up the Connecticut River, near Mt. Tom Junction, early in May, 1921, our attention was called to the loud call-note of the Greater Yellow-legs. The high river water of spring had overflowed the northern bank and left there a long lagoon-like pool of small width and depth. In this shallow water we discovered with the aid of the binoculars seven Yellow-legs, their heads bobbing and their call notes coming clear and rapid. Keeping under the lee of the high bank, we quietly paddled so near that the length of the canoe barely separated us. Very cautiously approaching, we obtained excellent observations at close range. Finally, to watch their flight we let our presence be known, when all flew off a short distance to a sandy beach of the river. Being unmolested they presently fell to preening their feathers and not long after one or two pulled up a foot and took a noon-day siesta, with heads tucked under wings. Most of the others followed suit and so we left them. Returning late that afternoon, I headed the canoe for the spot where we first discovered them. My companion impetuously broke the stillness to say

that it was useless to come to the high bank a second time; the birds surely had flown away. But he had scarcely said the last word when a chorus of alarm notes close by came from the lagoon, and presently the Yellow-legs rose in air. Their flight this time was different. Rising gradually they flew with strong wing-beat in close array into the western twilight until they were well up over Mt. Tom Junction. As they wheeled to the right high in air, we dimly discerned them as they faded out of sight in a direct course up the Valley, flying apparently straight over Northampton instead of following the meandering river. Doubtless when returning daylight came, it found them beyond the Canadian border, well on their long journey to northern Labrador or Ungava. On another May day I recall a single Nighthawk that lay lengthwise on a limb of an elm tree in our front yard, twenty-five or thirty feet above the sidewalk. Both eyes were closed, and he seemed to be sleeping undisturbed although the branch swayed with the breeze. His perch was within twenty feet of the house. Not till nearly dusk did he take leave. Such nocturnal flights are comparatively easy on a bright moonlit night, for the rivers stand out like silver threads as the birds wing their way on high. Like sleeping sentinels the taller hills or peaks lie revealed, and from this great height the most direct route is readily discernible. It is, however, in the fall when the great host, now voiceless and with many birds still in molt, makes the return journey that this pathless course of the upper air is employed to the largest extent. The late William Brewster after his intensive study of migration at Point Lepreaux on the Bay of Fundy, came to the conclusion that birds migrate either singly or in straggling bands; that the different bands are connected with others so as to form a practically continuous stream of birds; that adults precede or accompany the first flights of the young.

How often on a starlight night in late September or October can one hear the lisping notes of the Warblers, some faint, others low down and distinct as the multitude pass southward. Brewster found not only at Point Lepreaux but elsewhere that on favorable nights the sky is literally "alive with birds." (Such nights are not infrequent in our Valley when the flight is on.) He felt, moreover, that young birds whose parents had departed earlier,

fell in with the general procession; that because of a strong sense of locality and direction they "quickly learn to follow a path, even for thousands of miles, along which they have been in the first instance led by older companions, and the young bird after a few seasons becomes an experienced guide." This must be the case likewise here in the Valley, where, because of the guiding peaks and the north and south direction for so much of its distance, it must be a simple matter for even young birds to become accustomed readily to any portion of it. In the fall, then, we find the spring flocks now augmented with large numbers of immature birds, and distinct flights occur. In August for instance the Nighthawks pass down the Valley in some seasons in great numbers. Mr. James Mackaye, of Boston, tells of a flight of this kind in August, 1881, near Brattleboro when he observed hundreds flying overhead in one large flock. September brings by night the Warbler host accompanied by Vireos and Thrushes. By day the Swallows and Swifts take leave and the Hawkflights occur. In 1921, the Hawks came on September 18th, when seventy-five or eighty, mostly Red-tailed and Red-shouldered Hawks, were counted in one flight. In some years these flights vary according to the lateness of the season. In 1910 for example it did not occur until October 10th. This flight, however, was one long to be remembered for four or five hundred Hawks made up the lengthy line that drifted at noon over Holyoke. They were travelling at rapid rate although few wing beats were noted; all were taking advantage of the strong northerly wind which carried them along with so little effort. The older Hawks seem to await such a favorable wind before starting a flight of this kind down the Valley. October, like April, is the special month for the Sparrows—this time on the return trip. One would imagine it was the same flock in one's garden staying the month out; but bird banding has proven that a flock will remain several days until a storm arrives when they go on for the next lap. The same storm, however, brings in a new group which remain until the following storm, and so on. About the middle of October the Woodcock flight arrives. Then it is that the alder thickets harbor a host of these nocturnal travellers, particularly with the coming of the hunter's moon. Night after night they continue to arrive and move on, and many



THE CONNECTICUT VALLEY.

View from Mt. Toby, looking north. Tops of the Green Mountains in the distance.

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linger very late in the fall. In 1908 one lingered until December 8, but was picked up in Agawan having died only a short time previous. A Woodcock has been captured in January, not far from Saybrook, with six inches of snow on the ground and a gale blowing. It was found near an open spring-hole, and was in an emaciated condition. Another was observed as early as March 8 in 1919, in the vicinity of Holyoke. With the coming of colder days and nights in November the Robins and Bluebirds retreat. All through the fall they had been going south in scattering bands or mixed flocks, but now even the rear guard disappear, although a few Robins occasionally winter especially in the vicinity of the Mt. Tom and Mt. Holyoke Ranges. During the winter of 1921-1922 a flock of eleven Meadowlarks remained near the Amherst Agricultural College Campus, and three or four more near the Mt. Holyoke College Campus. November witnesses the gathering of immense flocks of Crows from the wooded hill country to the east and west. They come into the Valley as severe weather sets in. Sometimes Crow flights occur. Mr. Mackaye records one of these flights in the late fall of 1881 near Brattleboro. He first noticed the Crows in a long cloud-like formation coming down the Valley and gradually settling and coming to rest on a hill where, even though more than a mile away, the babble of so many voices made a great noise. With the coming of inclement weather many Crows desert the valley of the Connecticut and its tributaries north of Massachusetts. Upon the return of the species with the passing of winter, the Crow in many places (as in Haverhill, N. H.) is regarded as a harbinger of spring as much as the Robin or the Song Sparrow. Early in November, 1919, a similar gathering of several thousand Crows was noted at Worthington, Massachusetts. With the initial snowfall such flocks retreat into the Valley to pass the winter in the vicinity of Mt. Tom and Mt. Holyoke where favorable roosts are found. When the snow becomes deep, however, they retire still further south. The season comes to a close with the flight of Canada Geese which occurs usually in late November or sometimes early December. Again, Brewster believed that along every route could be found "stations or points of departure"—favorable places where the "migratory tide hesitates or halts" either for rest or food. Let me mention several in our Valley.

A few hours flight from the Sound brings most birds to the section of the Valley, where there are numerous ponds, streams, swamps or tributary valleys, ideal natural locations for every sort of refuge and food. I have in mind particularly the region extending roughly from the Connecticut state line to the vicinity of Mt. Tom. Mr. John H. Sage tells of several hundred acres, known as the Little River Meadows, on the opposite side of the Connecticut River from his home at Portland, Conn. From boyhood days he annually witnessed there great Swallow flights in August. There were Barn, Eave and Tree Swallows, principally the last, all of whom took refuge for the night in the water-oats which grew in abundance. In close ranks one above the other they clung to the standing stalks. They first began to gather, he noted, early in August, and continued until late in September, when the majority departed. He has found a few there until the last week of October and states that it is an excellent place likewise for "Rail, Marsh-Wrens and many other birds" ('The Auk,' Volume XII, p. 83). These marshes are likewise a favorite roosting place of Grackles, thousands of the Purple and the Bronzed varieties flocking there in the late summer, and according to Mr. Sage, outnumbering in early November all other species. I have already mentioned the wild rice fringing the river for half a mile in Long-meadow, just above the Connecticut state line. The expense of securing the wild rice was shared by Mr. M. B. L. Bradford and Mr. Morris. They secured the seed from Minnesota. Mindful of the proper time in the fall for planting they carried it down the river by rowboat, and were successful in starting a strip about two hundred yards long close to the shore. Each succeeding year saw the growth of this rice widen and lengthen until today it is about half a mile long and fifty yards wide. It has attained a height of six feet or more. Here and in the fields adjoining Mr. Morris has collected many of his unusual records including Bonaparte's Gull, the Common Tern, the King Rail and the Yellow Rail. It is here, too, that nearly every fall, late in August, he has recorded the Black Tern. The Black Rail has also been observed here. In the fall the wild rice proves an attraction for not only Sandpipers, Snipes and Ducks but for large flocks of Blackbirds and of Savannah and Swamp Sparrows which with an occasional

Sharptail congregate there. The only record we have of a Savannah Sparrow wintering is of one which Mr. Morris found near here in 1895-96.

A dozen miles directly west of Springfield lie Southwick Ponds or Congamond Lakes. They comprise a group of four narrow, connected lakes, two and one-half miles long by one-half mile wide. Gulls, Ducks, Geese and other waterfowl visit these ponds frequently. Mr. Morris for a long time was of the opinion that Laughing Gulls came occasionally up the Valley as far as Massachusetts. While rowing on the Ponds early in October, 1920, he noted a Gull resting alone on the water. On coming within twenty feet he discovered it to be a Laughing Gull which seemed not at all disturbed by his proximity. Rarely the White Egret visits these ponds. In mid-July, 1920, early in the morning, Mr. E. S. Smith of Holyoke, after an all-night fishing trip, came upon an Egret in the shallow water near shore. It appeared unusually white in the mists of early dawn. It was here too, that a large flight of Snow Geese, the first in many years, were reported in late November or early December, 1921. Three were shot on Thanksgiving Day, in Westfield Little River, the Springfield Museum specimen, an immature Greater Snow Goose, being one of them. One was taken at Portland, Conn.; another at East Windsor Hill; and a small flock was observed about the same time at Glastonbury. All undoubtedly were part of the main flock estimated at upwards of one hundred which visited Southwick Ponds.¹ In the days of the first settlers these Geese numbered thousands, and every year in the fall flight in particular they used the Connecticut Valley as a highway. Today we have their kin—the Canada Geese—whose spring and fall flights usher in and bring to a close the main migration season. Their V-shaped formation and loud honkings are familiar occurrences in mid-March and late November. The last two seasons have brought the largest flights recorded in many years. Sometimes they arrive much hampered by sleet and ice storms. The writer's grandfather in his early days caught by hand several geese so coated were they with ice. This occurred about a century ago near his farm in West Springfield, Massachusetts.

¹ See *Auk*, vol. XXXIX, Apr., 1922, p. 251.

A score of miles north of Southwick, the confluence of several small valleys in what is known as Fomer brings about conditions especially favorable to migrating birds. During the winter of 1918-19 came a large influx of Downy and Hairy Woodpeckers. On Lincoln's birthday of that winter, which was an unusually open one, the writer saw at Fomer the Arctic Three-toed Woodpecker reported wintering there since November. We found him peeling bark and boring for timber beetles (*Buprestidae*) in a burnt-over patch of white pine. That same day we observed not far from there a dozen Robins in one flock. On November 29, 1921, an immense flock of Pine Grosbeaks was noted here, spread out over half an acre and numbering it was estimated, from three to four hundred birds. There are many more such stopping places equally favorable that we might tell of. Hampden Ponds, Ashley Ponds, the Island in the river at Holyoke, Aldrich Lake, Forge Pond, Carver's Pond and others in the vicinity of Holyoke all come within such a group. The Hadley meadows mentioned earlier in the paper equal perhaps any other such place we could mention. It was here through the seventies and eighties that Mr. E. O. Damon of Northampton collected among others, such unusual birds for the Valley as Knot, Buff-breasted Sandpiper, Hudsonian Curlew, Red-breasted Merganser, Prothonotary Warbler, Gyrfalcon, Great Grey Owl, American Hawk Owl, and Northern Raven. Clerk of Courts Chilson of Northampton was an expert in collecting Rough-legged Hawks here. "If you went afoot with a gun," he relates, "your hawk was sure to see you and take flight a long way off, but a passing horse and buggy they would not suspect. By driving my horse at first in large circles and gradually cutting these down until within range, and then galloping rapidly toward the tree, I could usually secure my specimen."

Various sea birds driven inland by storms are taken from time to time in the Valley. A Red-throated Loon at Hartford caught itself in the electric street wires during a fog and was captured on November 20, 1895. A Brunnich's Murre was taken by Mr. Morris, November 30, 1899, in Longmeadow and two more were taken near there—one on December 19, 1897, following a severe gale, the other in January 1901; still another was taken February 1,

1902, in Ware. The Dovekie has been taken at Greenfield and Belchertown where in 1872, large numbers were secured. The Leach's Petrel was taken September 2, 1900, at Agawan; October 11, 1905, at Hampden Ponds; and in October, 1908, at Smith's Ferry. A Black Skimmer was found exhausted in the latter part of August, 1893, in West Springfield. In 1877 or 1878, a number of Double-crested Cormorants were taken from small flocks near Springfield. Red-breasted Mergansers have occurred—one April 28, 1908, in Longmeadow and one prior to that in Northampton; also Gadwalls—one October 14, 1904, at Glastonbury, Conn., and one November 5, 1883, at East Hartford. Old-squaws, American, Surf and White-winged Scoters, and Brants have been either identified or taken near Springfield. Two species of Phalaropes have been known to use the Valley in the fall as well as the Purple Sandpiper, Red-backed Sandpiper and Willet.

By the keeping of migration dates up and down the Valley, museums, scientists and interested bird students have collected much valuable data relative to arrivals and migrations. It is hoped to establish a series of banding stations throughout the length of the Valley. Bird banding more than any other agency should reveal all and more than all that can be written emphasizing the importance of the Connecticut Valley as a highway for migration; and of its constant use, year in and year out, by thousands of migrants in both directions.

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BLUE FEATHERS¹

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AND CLYDE W. MASON.

PHYSICISTS distinguish between pigment and structural colors. Pigment colors depend on the chemical nature of the material and are due to the absorption of certain wave-lengths by the mole-

¹ The investigation upon which this article is based was supported by a grant from the Heckscher Foundation for the Advancement of Research, established by August Heckscher at Cornell University. The paper, of which this is an abstract, will be published in full in the Journal of Physical Chemistry.

cules. Structural colors depend upon, or are modified by, the physical arrangement of the material. The colors produced by a prism are structural colors and so are the diffraction colors of gratings and the interference colors of thin films. With turbid media in which the particles are small relatively to the wave-lengths of light, the shorter or blue wave-lengths are scattered much more than the longer or red wave-lengths. In consequence such a medium is reddish by transmitted light and bluish when seen from the side. These blues are called Tyndall blues, typical cases being the blue of the sky, of cigarette smoke, of skimmed milk, and of blue eyes. In all these cases of structural colors, the colors can be produced starting with materials which are in themselves colorless. The rain drops which give rise to the rainbow are colorless; a diffraction grating may be a sheet of colorless glass with parallel lines ruled on it; a thin film of a colorless oil will give us interference colors, and we can get the Tyndall blues by suspending a colorless powder in water. The arrangement of the material is what gives rise to the colors. In feathers the reds, yellows and blacks are pigment colors; the whites, blues, and the metallic colors are structural colors; and practically all the non-metallic greens are a structural blue and a pigment yellow.

A study of the question of structural colors in feathers indicated that this is apparently a problem calling for a co-operative research on the part of men representing different fields. This point of view was put before the Heckscher Research Council, and on July 1, 1921 a grant (No. 37) was made, for the study of structural colors in feathers, to a committee consisting of Messrs. Bancroft, Chamot, and Merritt, representing physical chemistry, chemical microscopy and physics respectively. As an unofficial member representing ornithology, the committee has had the enthusiastic co-operation of Mr. Louis Agassiz Fuertes, who was really responsible, initially, for the starting of the whole investigation. In addition, the work of the committee has been facilitated by the courtesy of Prof. A. A. Allen of Cornell University and of Dr. Frank M. Chapman of the Natural History Museum in New York, who have furnished many interesting feathers. For the experimental side the committee has been fortunate in securing the assistance of Mr. Clyde W. Mason, assistant in chemical microscopy at Cornell University.

It is to his skill and perseverance that the successful outcome of the investigation is due.

White is the most common and the simplest of the structural colors. We do not get the sensation of white when white light is reflected from a mirror but we do get it when white light is reflected diffusely or scattered from a surface. Thus powdered glass, chopped ice, snow, sugar, foam, clouds, paper, etc. appear white because of the light scattered from the surface. A block of ice or a pane of glass is transparent and not white. If a transparent, colored crystal, blue copper sulphate for instance, is powdered fine, the light scattered at the surface predominates so over the light which has passed through the crystals that these latter appear nearly white. If the powdered crystals are immersed in a liquid having practically the same index of refraction as the crystals, the amount of light reflected diffusely from the surfaces is reduced to a minimum and the powder appears blue if the large crystals were blue, or transparent if the large crystals were practically colorless. Oiled paper becomes translucent. The transparent "windows" in many business envelopes are made of paper which has been impregnated with material having very closely the same index of refraction as the paper, thereby doing away with the diffuse reflections which ordinarily make the paper appear white and opaque. Water colors get paler as they dry because the water is replaced by air. The difference in the indices of refraction between the medium and the pigment being greater, there is more light scattered from the surface of the pigment and this therefore looks paler. It has been stated¹ that the reason some flamingoes in zoological gardens are redder than others is because the red ones have more oil in their feathers, this making the feathers more translucent and intensifying the red.

All the so-called white pigments owe their whiteness to the diffuse reflection of light. Ground sand is not so effective a white paint as white lead because its index of refraction is too near that of linseed oil. If we had a drying oil with an index of refraction about equal to that of white lead, this substance would be worthless as a pigment, whereas sand would make a good one.

¹ Krukenberg: Vergleichend-physiologische Studien, 1 (5), 90 (1887).

The white color of flowers is due to the cellular, optically inhomogeneous, structure. The tiny cells, filled with juices, scatter the light very completely. In some flowers these cells may be seen with the naked eye, as in the narcissus, the petals of which have a frothy, white appearance. Crushing the flower destroys the minute structure and removes the juice, leaving a transparent mass. Birch bark can be made colorless and transparent by impregnation with cresol, etc. In this case the bark is porous and the pores are filled with air which can be seen to escape in bubbles when the cresol displaces it from the pores. The white bark of the sycamore behaves similarly, though here the outer surface of the cellular layer is distinctly rough, thus increasing the diffuse reflection and giving a chalky appearance, which disappears on impregnation with cresol. Certain butterflies (*Pieridae*) owe their whiteness¹ to the presence of uric acid in a very finely divided form. Large crystals of uric acid are colorless and transparent. The intensely white bellies of such fish as the mackerel and the flounder owe their color to crystals of guanin² which in themselves are colorless and transparent.

It is generally recognized that white in feathers is a question of structure;³ but there seems to be no definite statement as to the exact mechanism and consequently a more detailed study has been made. The whites fall into two classes: a white which disappears if the feather is treated with a liquid of the proper refractive index; and a white which is not changed by a liquid of any refractive index whatsoever. In both cases the sensation of white is produced by the diffuse reflection at a multitude of minute surfaces of optical inhomogeneity; but the two types differ in the nature of the inhomogeneity in structure.

The barbules of white feathers play the chief part in the sensation of whiteness when looking at a feather. The barbules of such typical white feathers as those of the white Leghorn, Turkey, Pigeon, Duck, Peacock, etc., are seen under the microscope to be

¹ Hopkins: Phil. Trans. 186 B, 661 (1896).

² Cunningham and McMunn: Phil. Trans. 184 B, 765 (1893).

³ Cf. Newbigin: Colors in Nature; Beddard: Animal Coloration; Poulton: Colours of Animals; von Bezold: Theory of Color in Relation to Arts and Industry; Gadow: Proc. Zool. Soc. London, 1882, 409.

colorless, transparent, more or less spatulate processes on the barbs of the feathers. They possess no significant internal structure, and when mounted in balsam, cresol, etc., are transparent and almost invisible to the eye. Their surfaces are often somewhat roughened. These innumerable, transparent, colorless barbules cause a large amount of diffuse reflection and consequently the feather appears white, exactly as snow, cotton, paper, etc., appear white.

When, however, the feather is wetted thoroughly with balsam, or cresol with an index of refraction of 1.54, which is practically that of the barbules, the feather becomes transparent and one may read through it with ease. The barbs themselves are not rendered transparent by this surface wetting and appear as white lines in the transparent plane of the feather; but they do not occupy a large proportion of the space and consequently the effect as a whole is one of transparency.

A similar type of whiteness is observed in the barbs and shafts of white feathers. In these the scattering takes place at the surface of pores in the walls of the cells of the barbs or at the surfaces of the bubble-like, cellular, pithy material in the core of the quill, these surfaces being in contact with air. The structures of these pores, bubbles, etc., are readily observable under the microscope. They are actually transparent and colorless if a thin section of the part of the feather in question is examined with moderate magnification. If the air in these pores and interstices is replaced by a liquid of the proper index of refraction, about 1.54, the sensation of whiteness disappears and the feather appears transparent. Since most feathers have the porous structures encased in a transparent, almost impermeable membrane of keratin, there is some difficulty in replacing the air by liquid. Prolonged soaking will do it; but the desired result may be obtained more rapidly by sectioning, and thus laying open, the porous part. Longitudinal, oblique, or transverse sections permit the liquid to penetrate the feather rapidly, the pores filling in a few minutes, the air in them bubbling out, as can be seen under the microscope. Cresol, with an index of refraction of 1.54, gave the best results. If the index of refraction of the liquid differs widely from 1.54, the whiteness

is not destroyed completely and only partial transparency is obtained.¹

The second type of white found in feathers is characterized by the fact that liquids of any refractive index whatsoever have no effect upon it. This type is found in most white quills (white turkey, goose, hen, etc.) and occurs usually in the outer sheath of keratin, which appears a translucent white to the naked eye. Microscopic examination shows that this keratinous sheath is fibrous and consists of numerous, elongated cells, packed closely together to form the horny layer. There are enough differences in the refractive indices of different portions of the material to cause diffuse reflection and a sensation of whiteness, which is not very marked because the differences in the indices of refraction are not large. Since the differences are due to the presence of two or more solids, addition of an organic liquid will not eliminate these differences and will not affect the whiteness.

The white or albino varieties of birds, which normally are colored, are white simply because of no pigment. The structure is, or may be, the same in the colored and the white varieties; but the absence of pigment permits the structural white being seen. Whitman² states that albinism is a deficiency of pigment (which may develop in later life) rather than any special development of white.

The non-metallic blues, such as the feathers of the Blue Jay, the Bluebird, the Indigo Bunting, and the Kingfisher are structural colors. There is no blue to be seen by transmitted light and nobody has ever succeeded in extracting any blue coloring matter³ from any blue feather. Haecker and Meyer³ showed that the structural blue is what is known as Tyndall blue and is due to the scattering of light by minute air-bubbles in the horny mass of the

¹ The "clearing" of tissue, as a step in its preparation for study, is a process familiar to the biologist and is essentially similar to the treatment of the feather. If the cells of a tissue are filled with air or with a liquid having an index of refraction differing considerably from that of the cell walls, the finer details of the latter can only be brought out by making the mass more transparent through introduction of a liquid having practically the same index of refraction as the tissue. The mounting liquid, usually used is balsam with a refractive index of 1.54, which is close enough to that of most organic tissue to be satisfactory.

² Carnegie Inst. Pub. No. 257, 2 (1919).

³ Krukenberg: *Vergleichend-physiol. Studien*, 1 (5) 98 (1881); 2(5) 154 (1882).

³ *Zool. Jahrbuch. Abt. Syst. Geog. Biol. Thiere*, 15, 267 (1902).

feather; but this view has not been accepted generally by the biologists. It is believed that the data now submitted will be conclusive as to the correctness of Haecker's theory.

A turbid medium, containing particles something less than 0.6 microns (0.0006 mm.) in diameter and having an index of refraction differing from that of the medium, is reddish by transmitted light and bluish by reflected light. The blue goes over to the violet as the particles become smaller. If the particles, which scatter the light, are sufficiently large to scatter the longer wave-length appreciably, the scattered light is no longer a clear, deep blue, but changes towards the white. Tyndall showed that increasing the size of smoke particles gave a whiter smoke. The blue of a turbid medium shows up best against a dark background because this serves to keep any transmitted light from reaching the eye. In fact, a blue which is quite marked against a dark background may appear whitish or almost colorless against a light background.

If the suspended particles and the medium have the same index of refraction, there can be no scattering of light at the surfaces of the particles and the Tyndall blue will disappear. As a matter of fact, even approximate agreement between the refractive indices of the particles and the medium is sufficient to cause a very marked decrease in the intensity of the scattered light. The behavior of a collodion jelly was found to show this fairly well. If a limpid, colloidal solution of collodion in an ether-alcohol mixture is allowed to evaporate slowly, a soft, turbid, bluish jelly is formed, the color being the Tyndall blue. If the jelly is immersed in a liquid with which the alcohol-ether mixture is miscible, the mixture will diffuse out fairly readily and can be replaced by the other liquid. This has been done with water, kerosene, cresol, cedar oil, monochlorobenzene, and other organic liquids. When the substituted liquid is cresol, the jelly ceases to be whitish blue and becomes colorless and transparent; its outlines being almost invisible in the cresol. When the excess cresol is poured off, the jelly looks like a clear, colorless piece of glass, though it has not lost its gelatinous character. The scattering of the light by the jelly has been eliminated by making the medium cresol, which has practically the same index of refraction as the collodion. The data in Table I show that the effect depends on the index of refraction of the liquid in the pores of the jelly.

TABLE I.

Liquid	Refractive Index (N)	Turbidity (Color)	Outline
Monobromo Naphthalene	1.66	marked	distinct
Carbon Bisulphide	1.625	marked	distinct
Iodobenzene	1.61	moderate	distinct
Bromoform	1.58	very slight	faint
Cresol	1.54	none	invisible
Chlorobenzene	1.525	none	invisible
Cedar Oil	1.51	none	almost invisible
Xylene	1.494	very slight	very faint
Turpentine	1.474	slight	distinct
Kerosene	1.443	moderate	distinct
Alcohol	1.37	moderate	distinct
Water	1.33	very marked	distinct

From the table we see that the bluish color is more marked, the greater the difference between the indices of refraction of the liquid and of the collodion; but that the effect is similar with monobromo naphthalene which has a higher index of refraction than the collodion, and with water which has a lower index of refraction.

The light scattered by a turbid medium is polarized provided the particles are small enough to scatter blue light. This polarization can be observed easily by viewing a beam of light in a turbid medium through a nicol prism, at right angles to the path of the beam. The vibrations of the scattered light are in the plane normal to the direction of the beam in the turbid medium, and a nicol prism, adjusted to intercept vibrations in this plane, renders the beam invisible. If the nicol prism is rotated, the beam is visible through it only when the nicol is in position to transmit vibrations normal to the direction of the beam. The light scattered by the turbid medium is cut out almost completely when the nicol is set to transmit only the vibrations in the plane parallel to the direction of the beam. This rather striking effect can be seen easily with blue smoke, collodion jelly, skimmed milk, partially devitrified glass—in fact with any medium which gives the Tyndall blue. If the blue is whitish, the polarization of the scattered light is not so complete and not all of the light can be cut out by the nicol prism.

A more sensitive means of detecting the polarization is by viewing the scattered light through a nicol prism with a "first

order red" gypsum plate between the nicol and the turbid medium. This arrangement is used by petrographers to detect slight polarization in the study of crystals with the petrographic microscope.¹ It substitutes a color change from greenish blue to reddish purple, when the nicol prism is rotated in a beam of polarized light, for the usual change from light to dark. The change in color can be detected more readily than the change in intensity, especially when the polarization is only partial.

Professor T. R. Briggs, of Cornell University, showed that a good Tyndall blue can be obtained by heating a Jena glass rod carefully until it devitrified partially. Still better results were obtained by Mr. Mason who heated a piece of Jena glass tubing in a combustion furnace at a temperature just below the softening point of the glass. Two hours heating is generally sufficient; but the time required is shorter at higher temperatures. It is best to allow the glass to cool at intervals and to examine it against a dark background. A strong clear blue results, which changes to an opal white if the heating is too prolonged. The blue color is due to the formation of tiny crystal nuclei which scatter the light. These particles can be seen under the microscope with 4 mm. or higher power objectives, if a horizontal beam of light is projected through a piece of the glass on which the microscope is focused. With careful focusing and some adjustment of the illuminating beam, the blue color seen in the field may be resolved into a dense mass of tiny points of blue light. With a little adjustment this crude ultra-microscope arrangement serves fairly well to detect the minute particles present in other Tyndall blues. The opal glass, which is obtained by longer heating, undoubtedly contains coarser crystals. Since the color by transmitted light is orange-red, the reflected light must theoretically be a bluish-white but the blue is lost to the eye.

By suitable length of heating the partially devitrified Jena glass tubes can be made to give blues ranging from deep indigo to pale sky blue or even to white. The color may be brought out most strikingly by painting the inside of the tube with black paint, so as to cut off the transmitted light. The blues of such specimens

¹ Johansen: Manual of Petrographic Methods, pp. 386, 393.

rival the richest of those found in feathers and of course are stable at ordinary temperatures.

In the non-metallic feathers, so far as known, the color always appears in the barbs. We find that a typical blue feather, that of the Blue Jay, shows the following structure in the barbs:—

1. A transparent, colorless, horny, outer layer or sheath, 10–15 microns in thickness, which serves apparently as a protective coating for the barbs.
2. Beneath this is a layer of cells, polygonal as seen from the surface, about 15 microns in diameter and the same in depth. The boundaries of these cells are ordinarily invisible, and, by reflected light, the cells give the appearance of a thick layer of blue enamel. (Described by Fatio, who called it “*émail*.”)
3. Beneath the layer of cells, and occupying the central portion of the barb, lie closely packed, hollow, medullary cells which contain a dark, granular pigment (melanin) mainly on the walls of the cells.

Gadow¹ summarizes his description of the barbs of a typical blue feather as follows:—

1. A transparent, apparently homogeneous, sheath of ceratine.
2. One layer of prismatic (polygonal) cells.
3. A brownish pigment.

Gadow recognizes the prismatic or polygonal cells as the seat of the blue color; but his reasoning as to the cause of the color production is incorrect, as will be pointed out.

Longitudinal, transverse, and oblique sections show these relationships more clearly than does the barb as a whole. The blue color is localized plainly in the layer of cells immediately underlying the outer sheath of the barbs. Removal, by sectioning, of the outer sheath layer, or of the pigmented medullary cells does not affect the appearance of the blue cells, when they are examined by reflected light. It is evident that the blue of the feather originates in this layer of polygonal cells and a detailed study of them is therefore necessary for an explanation of its cause.

The cells are seen to be distinct and separate, like tiles in a floor. Their color is a turbid blue by reflected light and a turbid reddish-

¹ Proc. Zool. Soc. London, 1882, 409.

brown by transmitted light. A most striking phenomenon is that the cells, when laid bare by removal of the outer sheath or of the medullary portion of the barb, are rendered nearly colorless and transparent by immersion in xylene. The change takes place cell by cell; and, as it does so, the details of the structure become visible. The cell walls are seen to be 3-4 microns thick, apparently rough and granular on their inner surfaces, and with a central cavity, roughly spherical in shape and 4-5 microns in diameter. The blue color is apparently only in the cell walls. When the xylene evaporates, the blue color and the turbidity of the cells are restored. Other liquids behave similarly; but the amount of change varies with the refractive index of the liquid, the change being less striking when the refractive index is less than that of xylene (1.49). The blue color of the cell walls does not disappear completely and the cell walls are not rendered completely transparent unless the refractive index of the liquid is about 1.54 ± 0.04 , though the line cannot be drawn sharply. The index of refraction of the cell walls is very close to 1.54. Liquids with an index of refraction greater than 1.58 fail to destroy the blue color or to render the cell walls transparent.

Ortho-cresol is the most satisfactory of the liquids used, both as to refractive index, which agrees almost exactly with that of the cell walls, and as to the rapidity with which it penetrates the feather. Even the entire feather of the Blue Jay, with the blue barbs protected by a thick sheath of keratin, is permeated in about four days. The black pigment in the medullary cells becomes plainly visible and the entire feather appears black. When the ortho-cresol evaporates or is washed out with alcohol, the original color of the feather is restored perfectly. The results thus obtained agree with those of Haecker and Meyer¹ on blue *Cotinga* and *Malurus* feathers except that they make the index of refraction of the cell walls about 1.52 instead of 1.54. Their data are given in Table II, the first color being that for reflected light and the second for transmitted light.

Study of the actual process of permeation of the cell walls is rather difficult on account of the rapidity with which it proceeds

¹ Zool. Jahrb. Abt. Syst. Geog. Biol. Thiere, 15, 267 (1902).

TABLE II.

	Refractive index for Na light	
Pure CS,	1.627	Distinct color, pale blue and pale yellow
CS, : C ₆ H ₆ = > 7 : 1 by volume	1.558	Distinct color, pale blue and pale yellow
CS, : C ₆ H ₆ = > 3 : 1 by volume	1.558	Traces of color
CS, : C ₆ H ₆ = 1 : 1 by volume	1.558	No color
Canada balsam		
Av. =	1.54	No color
Cedar oil	1.515	No color
Xylene	1.502	No color
Benzene	1.501	No color
Alcohol	1.362	Distinct color, light blue and golden yellow, changing to pale blue
Water	1.333	Strong color, sea-green and reddish yellow. Great transparency but pores visible.
Air	1.000	Strong color, cloudy blue and cloudy reddish yellow. Not transparent.

when the cells are exposed, as in a section, to the action of the liquid. Tiny air bubbles are often noted at the outer edges of the cells as the liquid penetrates, and a small bubble is often entrapped in the central cavity. As the liquid evaporates, air seems to be sucked suddenly into the cells through the walls, the central cavity fills with air, and the cell walls become blue again.

Careful observation shows innumerable, tiny pores, filling the cell walls and giving them a turbid, spongy appearance. A 4 mm. or higher power objective is necessary to reveal this porous character. Haecker and Meyer estimate the diameter of the pores at about 0.3 micron in a *Malurus* feather and at less than that in a *Cotinga* feather. A section of the cells in ortho-cresol appears practically invisible with the dark field illuminator. A few scattered points of blue light appear, which are probably pores from which the air has not been displaced by cresol. If the cresol is absorbed at one side of the cover glass by blotting paper, while

alcohol is applied at the opposite side, the cresol in the pores of the cell walls is replaced by alcohol, and the pores then show up plainly, the cell walls appearing filled with innumerable tiny points of blue light, distinguishable with difficulty as separate points. Water may be substituted for alcohol in the same way, and the intensity of the blue light increases. If the liquid in the pores is allowed to evaporate, the blue scattered by the air-filled pores is so bright as to give the effect of an almost solid color.

By transmitted light the dry preparation is yellowish-orange, this color disappearing when alcohol, or better cresol, replaces the air in the pores. This yellow or orange color, seen by transmitted light in the blue cells of blue feathers, has been confused with pigment color. Gadow¹ says that "the color of the cones [polygonal cells] is pale yellowish, or, if this is only the reflection of the underlying pigment, they are colorless." This is decidedly not the case, for the color exists unchanged even when the dark pigment backing has been removed by longitudinal or oblique sectioning and disappears completely when these polygonal cells are penetrated by a liquid of suitable refractive index. When thus permeated, these cells show no tinge of color but are transparent and colorless, thus proving conclusively the absence of any appreciable amount of pigment. When examined on a dark field, the cells are seen by virtue of the blue light which they scatter. The dark pigment layer which lies beneath the blue cells serves as a dark background to prevent transmitted light interfering with the production of the blue. If this dark pigment layer is removed by longitudinal sectioning, the blue color is seen only when the transmitted light is cut off by some sort of dark backing.

The Blue Jay feather is blue with black cross-bars and a white tip. If the white tip differs from the blue portion of the feather by not having any dark pigment, it should be possible to bring out the blue by suitable treatment. If surface reflections are eliminated by immersing the feather in a liquid with a refractive index of 1.54 for a time too short for the liquid to penetrate, and if the feather is then examined on a dark field by reflected light, a bluish color is plainly visible. Painting the back of the Blue Jay

¹ Proc. Zool. Soc. London, 1882, 409.

feather black with India ink makes the tip appear distinctly bluish. The blue is not so good as in the rest of the feather because the black background is not in as good a place as in the natural feather. The barbs of the white tip are reddish yellow by transmitted light. They are colorless when permeated by an appropriate liquid. Unless the background of India ink is supplied, the turbid structure of the white portion of the feather will not appear blue because the empty, unpigmented, medullary cells scatter white light like bubbles of air, and serve as a light background, thus obscuring the blue. If the medullary portion of the barb is removed by sectioning, there is no apparent structural difference between the porous cells in the blue and the white parts of the feather.

Removal of the pigment by prolonged bleaching with three per cent hydrogen peroxide destroys the blue color, though the blue is found to be unchanged if the pigment is not bleached completely. Examined on a dark field, the barbs of a feather which has been bleached almost perfectly, appear a pale, whitish blue, because of the medullary cells, which were black, now act to some extent as a light background, and therefore make the blue paler. The swelling of the feather is also a factor. When blue feathers are painted black on the back with India ink, bleaching does not destroy the blue color because the India ink is not acted upon.

Surface reflections from the outer layer of keratin of the blue barbs can be eliminated by immersing the feather in a liquid which has a refractive index of 1.54 and which does not penetrate too rapidly. A mixture of oil of cloves (1.538) and oil of anise (1.557) works well. Such a preparation consists essentially of the polygonal, cellular layer, surrounded by an optically homogeneous medium, because the keratin and the immersion liquid are practically identical optically. There is no change, therefore, in the light illuminating the preparation until it strikes the polygonal, cellular layer.

When a portion of a blue barb, mounted in this way and illuminated by a horizontal beam of light, is examined through the microscope as it lies on the stage, it appears fully as bright a blue as when seen under ordinary conditions. Examination by a nicol prism, mounted as an analyzer on the microscope, shows that

the scattered blue light is polarized, though not perfectly, and that the plane of vibration of the scattered light is normal to the direction of the incident beam. Rotating the analyzing nicol gives partial extinction when the plane of vibration of the nicol is parallel to the direction of the illuminating beam. Better results can be obtained by placing a "first order red" gypsum plate below the nicol. On rotation the color changes from greenish-blue to reddish-purple. Polarization of the scattered light is unmistakable, though far from complete. As an alternative method, the barbs may be illuminated by a horizontal beam of polarized light and the plane of polarization of the illuminating beam can be rotated. The intensity of the blue light is distinctly less when the vibrations of the polarized beam are in the vertical plane. A "first order red" plate may of course be inserted between the nicol prism and the preparation.

The incompleteness of the polarization of the scattered light must be due to the presence of some relatively large pores which scatter the light without polarizing it. Their presence would, of course, dilute all the effects which might otherwise be obtained if only very small pores were present. The presence of a greater number of larger pores is undoubtedly one reason why the white parts of the Blue Jay feathers do not give nearly as marked effects with polarized light as do the blue parts, even though the structures are essentially the same.

Haecker and Meyer¹ have shown that the variation in the intensity of the blue light reflected from a blue *Malurus* feather with varying wave-length of the incident light can be represented quite well by Rayleigh's formula for Tyndall blues.

Nearly all blue feathers show a change in color by reflected light to a greater or less degree, depending on the relative positions of observer, feather, and illumination. This is especially noticeable in the feathers of *Procnias viridis*, *Calliste lavinia*, *Pionus chalcopterus*, *Sialia arctica*, and other birds of similar bright blue color. When the observer faces the source of light and observes such a feather by reflected light, holding the feather below the line from the observer to the light, the feather appears a deep, almost

¹ Zool. Jahr. Abt. Syst. Geog. Biol. Thiere, **15**, 267 (1902); Bancroft: Jour. Phys. Chem. **23**, 409 (1919).

indigo, blue. If the observer stands with his back to the light and examines the feather by reflected light, the feathers appears a lighter more greenish blue. It is only the relative positions of illumination and observer to the feather that affect this color change and not the angle at which the light strikes the feather or the angle at which the feather is observed.

This phenomenon can easily be understood after examining an 'artificial blue feather' consisting of a partially devitrified Jena glass tube as previously described. Such a piece of glass is deep blue when seen against a dark background, while the transmitted light is yellowish orange. When the glass is held in such a position that both the blue scattered light and the yellowish transmitted light can reach the eye, the resultant color is a light, greenish blue, very similar to that observed with the feathers. In the feathers the color cells have walls of Tyndall blue, while the central cavities of these same cells are empty and may be compared to bubbles of air distributed more or less regularly in the turbid medium which forms the walls of the color cells. Bubbles appear relatively dark by transmitted light because a large proportion of the incident beam is reflected back at their surfaces. When the feather is between the observer and the source of illumination, though below the line connecting the two, the empty, bubble-like cavities of the color cells serve to some extent as a dark background for the Tyndall blue of the cell walls. When the observer has his back to the source of illumination, these cavities reflect some of the incident light back through the turbid medium to the eye, thus combining the reddish-yellow color of this light with the predominating blue color due to the scattering by the cell walls and thus giving a greenish-blue color to the barbs.

With dull blue feathers the blue is much less intense, appearing almost grayish, when the observer faces the source of light and examines the feather by reflected light with a large angle of incidence. When the observer is between the source of illumination and the feather, the blue color shows plainly by reflected light. This is very striking with *Andigena nigrirostris*, *Cyanocorax*, and, to a less degree, with other dull blue feathers. This may be explained as due to reflection from the surface of the feathers. Light, which falls perpendicularly on a transparent surface, is

mostly transmitted; but the intensity of the transmitted light decreases markedly and that of the reflected light increases correspondingly when the angle of incidence is large. With a medium having a refractive index of 1.55 less than five per cent of the light striking normal to the surface is reflected, the remainder being transmitted. At an angle of incidence of 75° twenty-six per cent of the light is reflected, and sixty-two per cent is reflected when the angle of incidence is 85° . Consequently, when the angle of incidence is large, much of the light is reflected from the surface of the feather and does not enter the turbid medium at all. The blue is made paler by the white light reflected from the outer surface of the feather. When the barbules are dark, the resultant effect is grayish and dull whereas the blue color appears at its maximum intensity if there is very little reflection from the surface (illumination perpendicular) or if this reflection does not reach the eye (illumination and eye on same side of feather). This effect is mentioned because it influences the appearance of all feathers more or less and because it plays an important part with the structural blues in regulating the intensity both of the reflected and of the scattered light.

Another interesting property of blue feathers is that, in general, the color is rather easily modified by pressure, the lighter blues changing to deep blue or indigo when the barbs are compressed beneath a cover glass under the microscope. The dark blue appears first where the pressure is greatest as, for instance, where two barbs cross each other. Unless the pressure has been very severe, the original color is restored when the pressure is removed. Crushing or hammering usually destroys the blue completely. Since the indigo blue produced by pressure is a color which occurs frequently in feathers not under pressure, it must be caused by a change in the structure of the cell walls which give rise to the color. Pressure would be expected to decrease the size of the pores in these cell walls and should therefore give a deeper blue, which is exactly what happens. When the pressure has not been too great, the elasticity of the cell walls would restore the pores to their original size when the pressure was removed and consequently the original blue would return. Even the white tips of the Blue Jay feather show a distinct blue under the microscope when pres-

sure is applied, thus indicating that they possess essentially the same structure as the blue portion of the feather except that some of the pores in the cell wall are abnormally large. The change of color with pressure is shown best by barbs which are not armored by a thick sheath of keratin. Under pressure dark blue barbs appear black because the pores of the walls in the color cells become too small to affect light. The cell walls therefore become transparent, permitting the underlying layer of dark pigment to be seen.

As might be expected the color change is in the reverse direction—from dark blue to light blue—if the cell walls are made to swell. Dilute sodium or ammonium hydroxide solutions, cresol, phenol vapor, gaseous ammonia, sodium hypochlorite, hydrogen peroxide, and even water have marked swelling action on feathers, the effect on the cell walls being more striking with those barbs which have a relatively thin keratinous sheath layer, because the color cells are then more readily exposed to the action of the reagent. Water and the solutions of the alkalies have the most effect on blue feathers. The original blue color of the feather always becomes paler, the dark indigo blues changing to sky blue, and the light blues becoming almost white. When the reagent which causes the swelling is removed either by washing or by evaporation, the original color is restored. Pressure on the swollen barbs also restores the original color or may even make the barbs a darker blue.

This change of color on swelling explains the frequently observed, perfectly reversible change from blue towards white when certain blue feathers are wetted. The feathers, which show this change in a striking manner, are generally waxy in appearance and have prominent barbs with poorly developed barbules, and with only a thin outer layer of keratin. Typical feathers are those of *Calliste lavinia* and *Procnias viridis*. On a collecting trip Mr. L. A. Fuertes shot a specimen of *Procnias viridis*, which fell into the river and he was horrified to find that the bright blue bird was quite white when fished out of the water. Fortunately the color returned when the feathers became dry.

The effects caused by swelling are distinct from those due to penetration by liquids, for permeation by liquid always results in a greater transparency of the barb, while swelling tends rather

to decrease the transparency, as well as to change the color. However, a single reagent may cause changes both by reason of its swelling action and also because it penetrates the pores in the walls of the color cells. For instance, cresol, as it acts progressively on the color cells of a barb, first swells them, giving a white rounded appearance to the individual cells, and finally permeates the cell walls, rendering them transparent and colorless. The cell cavities may yet contain bubbles of air, which finally appear to dissolve in the cresol as it fills the cavities. Water or dilute ammonium hydroxide swells the color cell walls, causing white, and finally permeates these porous walls; but, on account of the low refractive index of these liquids, the cell walls are rendered only partially transparent. By reflected light the empty bubble-like cavities of the color-cells may be seen, appearing almost pinkish orange through the porous cell walls, the incident light passing through them twice before it reaches the eye, thus increasing the pinkish orange color which white of this nature transmits. It is possible that the dark brown color of the medullary cells aids in giving a brownish gray, tinged with pink, to the feather which has been subjected to long swelling and penetration by a liquid of refractive index markedly different from that of keratin. These peculiar appearances, observable only with special treatment, are of little significance, but an explanation of them in the light of the findings here presented seems necessary. It is not an essential part of the proof of the nature of the blue of feathers, however.

It is worth noting that when light and dark blue adjoin each other in the same barb, one shade of blue grades into the other cell by cell. The individual color cells are of one shade throughout, usually either light or dark blue, with few cells showing intermediate shades of color. The appearance is that of tiles in a floor, part of which is light blue, part composed of light and dark blue tiles, and part of dark blue tiles. Apparently the cells, developing as individuals, though side by side, have slightly different color-producing structure. This same character appears when several adjacent, apparently identical, cells are subjected to swelling. Some are affected much more rapidly than others, and appear markedly lighter in color, though uniform in themselves. This simply emphasizes the individual character of the cells, as units of the color-producing layer.

The general appearance of some blue feathers is influenced markedly by orientation alone. For example, the blue feathers of *Coracias indica* when viewed from a position inclined to the plane of the feather, appear brilliant blue when the barbs are seen crosswise of the line of vision and dull, darker blue, when they lie in the same direction as the line of vision. The same effect is noticed, to varying degrees, in other blue feathers viewed in similar positions, and is striking enough to be worthy of mention, though the explanation is simple enough. When the barbs lie crosswise of the line of vision, practically nothing but the blue color is visible; the barbules, of darker color, are almost hidden by the blue barbs, which are thicker and form a series of parallel ridges. Maximum color is observed under these conditions. When the position of the feather is such that the observer sees between the ridges the general effect is much dulled by the appearance of dark barbules which are visible in this position. This is exactly the same effect one sees in "changeable" or "two-tone" silks, which are woven so that from one position the threads of one color are visible, while from another position the other color is more prominent.

The character of the barbules influences the blue color to a considerable extent. If these are white the blue appears pale and transparent, while if they are dark the blue gains strength, opacity, and brilliancy in some positions. If the barbules are only slightly developed, the blue feathers have a waxy, enameled appearance, while if the barbules are yellow or red the color of the feather as a whole will be modified by this admixture.

Dark bars across blue feathers, such as those of Jays, *Procnias viridis*, and others, are seen to differ from the blue portions only in the layer of the color-cells, which are constricted, ill-developed, pigmented, and apparently do not possess the thick porous walls necessary for the production of blue.

Only one case was found in which the blue is not accompanied by underlying pigmentation. The blue tips of the feathers of *Procnias viridis* may be permeated by cresol so that they are perfectly transparent and colorless. No pigment is observed in the barbs of these feathers, though the barbules are dark. These barbs consist essentially of rods of turbid blue material (densely

packed color-cells) with rows of bubbles (the cavities of the color-cells) down the central part of the barb. These bubbles play an important part in causing the blue-green to blue color change with angle, discussed above. Since the blue of the barbs of the *Procnias viridis* feather is not inferior to other blues, it appears that the dark pigment is really not absolutely essential to production of a good blue, provided the color-cells have the proper structure, though it undoubtedly does intensify whitish or pale blues, while lending opacity to the feather.

It has not been the aim in this investigation to examine all known blue feathers, but rather to develop methods by which any given blue may be studied and its character determined. The feathers examined were chosen without reference to their order or family, and include widely differing types. Since the identical nature of the blues of birds of the different orders has never been questioned, and since no reason to doubt this has arisen in the course of this work, further study of this point was felt to be superfluous in the present investigation.

Blue feathers of the following birds have been examined and found to owe their color to the Tyndall blue: Blue Jay (*Cyanocitta cristata*), Yucatan Jay (*Cissolopha yucatanica*), Tanager (*Tersina* [*Procnias*] *viridis*), Arctic Bluebird (*Sialia arctica*), Parrot (*Pionus chalcopterus*), Ant Thrush (*Pitta cyanoptera*), Tangara [*Calliste*] *thoracica*, Painted Bunting (*Passerina ciris*), Bronze-wing Parrot (*Trichoglossus novae-hollandae*), Roller (*Coracias indica*), Jay (*Cyanocorax*), Fairy Bluebird (*Irena puella*), Blue and yellow Macaw (*Ara ararauna*), Purple Gallinule (*Ionornis martinica*), Indigo Bunting (*Passerina cyanea*).

Krukenberg¹ was unable to obtain any green coloring matter from green feathers and he therefore considered the non-metallic greens to be due to a combination of structural blue with pigment yellow. Since then, a green pigment, Turacoverdin, has been isolated; but it is found only in the *Musophagidae*, and can therefore be ignored when discussing other birds. Haecker² admitted Krukenberg's view as to most green feathers; but pointed out that olive green may be due to a yellow pigment combined with the

¹ Vergleichendphysiol. Studien, 1 (5), 98 (1881).

² Archiv. mikr. Anatomie, 35, 68 (1890).

dark brown or black pigment, melanin. Gadow¹ agrees with Krukenberg that only dark brown and yellow pigments are found in green feathers; but he does not accept Krukenberg's explanation of the cause of the color.

The color of green feathers is located in the barbs, just as is the case with the blue feathers. When a green feather is held against the light, only a dark brown, almost opaque, color is to be seen. The properties and structure of green feathers are the same as those of blue feathers, as regards polygonal color cells with porous walls, dark underlying pigment, yellowish color by transmitted light, change towards blue under pressure and away from blue on swelling, partial polarization of the scattered light, disappearance of color on penetration with liquid of proper refractive index, etc. In short, green feathers are identical with blue ones except for the one fact that the transparent outer sheath of keratin is yellow and not colorless.

In some green feathers the color of the barbs may vary from bluish green at one end to yellow at the other owing to changes in the intensity of the blue. In such feathers the barbules and medullary portion of the barbs are usually free from dark-brown pigment in the yellow parts of the feather thus destroying the blue; but the structure is the same throughout. Such yellow feathers can be made distinctly green by painting them on the back with India ink, just as the white tips of the Blue Jay feathers are made blue. Of course, only the yellow feathers having the proper structure will become green when thus treated. Haecker points out that the same effect can be produced by underlying black feathers on the bird acting as a dark background, though the resulting green is more imperfect.

Penetration by cresol, or other liquid of the proper refractive index, renders the color cells transparent and colorless. The dark brown medullary pigment and the yellow of the outer layer are seen plainly. The original color is restored on washing and drying. Prolonged extraction of green feathers with hot alcohol results in the removal of some or all of the yellow pigment, with the blue remaining as a structural color, unaffected by solvents.

¹ Proc. Zool. Soc. London, 1882, 409.

The most simple way of showing that green feathers are only blue feathers with a yellow outer layer is by scraping, with a knife or scalpel, the colored barbs of the feather. Green feathers become blue under this treatment and examination with the microscope shows that a transparent yellow layer has been scraped off the outside of the barbs, leaving the blue color cells exposed. Sections, of course, show the same features.

Another striking demonstration of the entirely different nature of the yellow and the blue in green feathers is afforded by their behavior when faded. When blue feathers are exposed in a "Fadeometer" no loss of color results, but green feathers become blue in 20-40 hours exposure (equivalent to about 35-65 hours of direct sunlight). The pigment yellow of feathers is easily faded but the structural blue is unaffected.

It is possible to produce greens like those of feathers by covering a Tyndall blue medium (Jena glass, etc.) with a yellow varnish, while a blue feather dyed with a yellow dye, which does not penetrate to the color cells, becomes a pronounced green.

Parrots furnish excellent examples of green feathers; the Mexican Green Parrot (*Amazona*), *Trichoglossus novae-hollandae*, Blue and Yellow Macaw (*Ara*), all show greens which generally shade into yellow and blue. Other specimens studied include such Tanagers as *Tangara* [*Calliste*] *lavinia*, and *thoracica*, the Purple Gallinule, etc.

Some very pronounced and vivid greens, such as those of the Fruit Pigeons (*Ptilopus puella*, and *Ptilopus pulchellus*), Green Heron (*Butorides virescens*), etc., though lacking much of the brilliant lustre are nevertheless metallic colors, and not related to blue feathers. Their different nature is apparent under the microscope; the green color is entirely in the barbules, and is highly lustrous under the microscope while any further study only shows that we have here an entirely different type of color, which will be discussed later. Newbigin¹ discusses green in its relations to blue in Kingfishers and other birds.

As far as other pigments are concerned, apparently they are not found in combination with Tyndall blue in feathers to any con-

¹ 'Colour in Nature,' 288 (1898).

siderable extent, though the Blossom-headed Parakeet (*Palæornis cyanocephala*) is said to have blue barbs combined with red barbules, and the neck feathers of the Brazilian Hawk Parrot (*Deropterus accipitrinus*) have blue tips, while the middle of the feather is red, and the base is green. The blue tips are the typical Tyndall blue, with black barbules. Where the red coloration begins, the outer sheath layer surrounding the blue cells appears red, as does the base of the barbules. At this point there is actually a red transparent layer surrounding the blue cells, and the blue appears a pinkish purple. In the red part of the feather, however, the blue cells degenerate, the barbs are thinner, and the structure becomes that of a typical red feather. Near the base of the barbs the blue cells are developed somewhat, and the sheath layer is yellow, giving a green of the typical non-metallic sort. The modification of structure in the parts of the barbs where the red pigment exists is worthy of attention from the standpoint of the biologist. In some parrot feathers, which shade from red, yellow, and green, to blue, the structure of the blue and green parts does not appear to have degenerated completely in the red portion of the barbs, though no hint of the blue appears to be produced by it, but only white. Chandler¹ makes a point of various devices which Nature uses to produce similar color effects in feathers.

From the observations made on typical blue feathers it has been shown that the feathers satisfy the criteria chosen as a means of detecting Tyndall blue or the blue of a turbid medium. The scattered light is blue, the transmitted light yellowish; the blue requires a dark background to show up plainly; the blue may be rendered colorless and transparent by rendering the color-cells optically homogeneous; pores of dimensions of the order of the wave-length of blue light actually exist; the scattered light is polarized in the proper plane, and its intensity is inversely proportional to the fourth power of the wave-length; variations in shade of blue occur, and are apparently due to the presence of relatively larger pores. In short, the parallelism between non-metallic blues of feathers and the blue of a turbid medium is so complete that no reasonable doubt can exist as to their identity, particularly

¹ Univ. of Cal. Pub. Zool. 13, No. 11 (1914-16).

since no structures capable of acting as prisms, thin films, or diffraction gratings are present to be considered as possible causes of the color.

In the light of the evidence presented, Gadow's theory of the blue of feathers must be discarded completely. It is to be regretted that his explanation is still accepted and quoted, though it has been doubted and even disproved by several later investigators. A statement of his views seems necessary here, in order that their unsatisfactory features may be pointed out.

Gadow¹ ascribes the blue to ridges in the outer surfaces of the color-cells, which produce the color by diffraction, in the manner of a diffraction grating. His drawings show no ordered arrangement of these ridges, which would be necessary for a grating effect, nor does he explain how a grating could produce only the one color, blue. This error is a common one: gratings possess ridges and cause color; ridges are found in a colored substance, and the color is straightway ascribed to them. Gadow admits that the understanding of the production of the color would be "an almost superhuman task. We know only the result, namely—blue color"; yet the laws of color production by gratings have long been established and grating colors possess definite properties which serve to identify them. The presence of ridges in the feathers is incidental. Most blue feathers show no signs of them.

Gadow has not definitely located the blue in the walls of the color-cells, nor has he recognized any connection between the color by reflected light (blue) and that by transmitted light (yellowish). He has not observed any change in color under the influence of a penetrating liquid, though if he studied sections mounted in balsam he could hardly have failed to notice some penetration. Apparently the blue of a turbid medium is not considered as a possible cause of color. Haecker² has pointed out the inadequacy of Gadow's explanation, but only in a later paper³ does he reach the conclusion that the blue of non-metallic feathers is the same as that of a turbid medium (Tyndall blue) and not a "diffraction color." He says that "the blue color is due to:

¹ Proc. Zool. Soc. London, 1882, 409.

² Archiv. mikr. Anat. 35, 68 (1890).

³ Haecker and Meyer: Zool. Jahrb. Abts. Syst. Geog. Biol. Thiere. 15, 267 (1902).

(1) The difference between the refractive indices of the cell substance and air without involving the hypothesis that this difference is distinctly greater for blue than for red.

(2) The small size of the pores whose diameter is small in comparison with a wave-length of light."¹

The findings in the present paper confirm Haecker's theory completely, and emphasize the untenable nature of Gadow's views.

CONCLUSIONS.

1. Non-metallic blues of feathers are due to the scattering of blue light by very fine pores in the walls of the outer layer of cells of the barbs of the feather. This is the blue described by Tyndall, which is commonly observed in turbid media.

2. No blue pigments, and no other structural causes of blue color have been observed in non-metallic blue feathers.

3. Green feathers are essentially the same as blue feathers, except that the blue cells are overlaid by a transparent yellow layer.

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TWO NEW BIRDS FROM NICARAGUA.

BY WHARTON HUBER.

IN working over the ornithological material obtained by the 1922 Nicaraguan Expedition of the Academy of Natural Sciences of Philadelphia, I find two apparently undescribed forms which I have diagnosed and named as follows. My thanks are due now as always to Dr. Witmer Stone, Executive Curator of the Academy of Natural Sciences, for valuable help rendered and to Dr. Chas. W. Richmond of the U. S. National Museum for the loan of specimens for comparison. The color names used are from Ridgway's 'Color Standards' (1912).

Lurocalis stonei spec. nov.

Type.—A. N. S. P. No. 75160 ♂, ten miles above mouth of Banbana River, Nicaragua, June 6, 1922. Collected by Wharton Huber.

¹Cf. Rayleigh: Phil. Mag., (4) 41, 274 (1871); (5) 47, 375 (1899); Bock: Wied. Ann., 68, 674 (1899).

Characters.—Similar to *L. semitorquatus*, but smaller, spots on the upper surface brighter (cinnamon-rufous), spots on the breast smaller and of a darker brown ground (dark sepia brown). Black bars on abdomen more numerous and closer together on a sayal brown ground color.

Description of type.—Head and upper parts deep, brownish black, each feather with cinnamon rufous lateral spots. Feathers of hind neck grayish white mottled with black, tip of each feather with a black spot flanked by a small, triangular spot of cinnamon-rufous. Scapulars grayish white basally barred with black, ends of feathers brownish black with lateral spots of cinnamon-rufous. Some of these spots at least with black centers. Last secondaries grayish white barred and speckled with black, the larger central black spots cinnamon-rufous basally.

First primary uniform brownish black with a very narrow tip of buffy white. Second primary with three and third with four spots of cinnamon rufous on the outer web. Rest of primaries barred on both webs with cinnamon rufous. All of the primaries tipped with grayish white, edged basally with cinnamon-rufous. Rump brownish black, each feather with lateral spots of cinnamon-rufous, the spots lengthening into bars of grayish white as they near the base of the feather. Tail brownish black above, lighter below, crossed by interrupted bars of cinnamon-rufous, tip of tail becoming lighter. Chin, throat and upper breast deep sepia brown, each feather with lateral spots of cinnamon-rufous. A large white patch extending across the throat. Lower breast, abdomen and under tail-coverts have each feather with alternate bars of black and sayal brown. Axillaries sayal brown, each feather with central portion black. Length (skin) 192 mm. Wing 188. Tail 83. Culmen from nostril 7. Tarsus 11. Middle toe 15.

Remarks. This specimen was shot from a flock of 15 or 20 individuals that were flying back and forth over the Banbana River at dusk. The flight was much more falcon-like than that of a Nighthawk. They were very noisy in their flight, uttering a harsh call at more or less regular intervals. As the pitpan was travelling rather fast on the crest of a flood I did not have time to collect more specimens as we passed through the flock. This is so far as I can ascertain the first record of the genus *Lurocalis* north of South America. The species is named in honor of Dr. Witmer Stone.

The average measurements of three adult specimens of *Lurocalis semitorques* from South America are—

Length (skin) 216.3. Wing 218.6. Tail 87. Culmen from nostril 7. Tarsus 12.3. Middle toe 16.

***Streptoprocne zonaris bouchellii* subsp. nov.**

Type.—A. N. S. No. 75157 adult ♂, Eden (Lat. 14°-00' N, Long. 84°-26' W.) Nicaragua, March 25, 1922. Collected by Wharton Huber and J. Fletcher Street.

Characters.—Similar to *S. z. albicincta* but white collar in front decidedly narrower and much less white, only the tips of the lower throat feathers for about 3 millimetres being white, rest of the feathers sooty blackish presenting an indistinct and mottled collar, in some specimens the collar is barely traceable.

Description of type.—Forehead and pileum black, sides of the head, chin and throat sooty black; a white collar encircling the neck, clear white on the hind neck, white collar on lower throat and sides of neck presenting a mottled effect. White tips to feathers 3 millimetres or less in length; basally these feathers are sooty black; back, scapulars, rump and upper tail-coverts glossed with greenish. Length of (skin) 195 mm. Wing 197. Tail 72. Exposed culmen 9.5. Tarsus 20. Middle toe 14.

Female.—Slightly larger in size than the male. Similar in coloration but slightly darker.

Remarks: While the range of this subspecies is at present unknown, it will probably be found at the higher elevations of the interior mountain ranges of Nicaragua. It is named in honor of Dr. Theodore W. Bouchelle who rendered us invaluable assistance in our work in Nicaragua.

The measurements of eight specimens shot by the writer at Eden, Nicaragua are as follows:

MALES		Length (Skin)	Wing	Tail	Exposed Culmen	Tarsus	Middle Toe
A. N. S. No. 75157 Type	March 25, 1922	195	197	72	9.5	20	14
A. N. S. No. 75160	April 1, 1922	178	194	70	8.	20	14
A. N. S. No. 75156	March 25, 1922	194	194	79	8.5	21	14
A. N. S. No. 75159	April 1, 1922	185	196	79	9.	21	14
Average		188	195.2	75	8.7	20.5	14

FEMALES		Length (Skin)	Wing	Tail	Exposed Culmen	Tarsus	Middle Toe
A. N. S. No. 75154	March 25, 1922	201	201	83	9	21	14
A. N. S. No. 75155	March 25, 1922	211	205	84.5	9	21.5	14.5
A. N. S. No. 75158	March 29, 1922	175.5	191	78	9.5	21	13.5
A. N. S. No. 75161	April 1, 1922	185	195	75	9.5	20	14
Average		193.1	198	80.1	9.2	20.8	14

Academy of Natural Sciences of Philadelphia.

ROUGH NOTES ON THE AVIFAUNA OF PAITA, PERU.

BY G. E. VERRILL.

THE following is from notes made during the period from September 19, 1920, to December 10, 1921, while the writer was engaged in engineering work at Paita, and Arenal.

As his time was largely occupied with his professional duties, no collections were made and the notes were simply kept as a matter of personal interest.

Paita is located on the western coast of Peru, about 5° south of the Equator. During the day, especially in the summer, it is very hot but the nights are cool, usually cool enough to require a cotton blanket in summer and the addition of at least one, and sometimes two, woolen ones in winter. It is never so cool, however, as to make a fire desirable. Rain is almost unknown, the total precipitation while I was there being certainly less than one inch and probably less than half an inch. During the winter the forenoon is usually dull and cloudy but the afternoon is almost invariably sunny. Mist and fog, known as "garua," which make Lima so disagreeable in winter, are rarely seen at Paita. There is much wind, especially during September, October and November. The forenoon, until about 11 A. M., is usually quite calm but in the afternoon and evening the wind blows very strongly. On the land side Paita is surrounded by a plateau, known as "El Tablazo," about 200 feet above sea level, Paita itself being at the foot of the cliffs and only a few feet above high water. This plateau is old ocean bottom, composed of clay, sand, and gravel, with occasional outcroppings of shell limestone and is an almost perfect desert. The only vegetation consists of a few shrubs, nearly buried in sand, some small sedum-like plants and here and there a very few other kinds of desert flora. Prior to 1891, there are said to have been copious rains every few years and the tablazo is said to have then been well covered with vegetation, including trees, of which the dead remnants still remain in some places. It is also stated that vegetables, cotton, and even grapes were

raised there. In 1891 there was a particularly heavy rain but practically none has fallen since then. Owing to the high winds the sand drifts badly and in some places forms moving dunes, six, eight and even ten-feet high. When water is applied, as from a broken main, vegetation quickly springs up, showing the presence of seeds. At Paita itself, there is no vegetation except in the Plaza de Armas and other places where trees and plants have been set out and kept irrigated. The nearest stream, or other body of fresh water, is the Chira river, 16 miles up the coast from Paita. The valley of the Chira is a mile or more wide and fertile, being well wooded and much cultivated.

Under the conditions above described the number of land birds found in the vicinity of Paita is naturally limited, as are also nearly all forms of terrestrial life except the genus *Homo* and various domestic animals, man being apparently about the only animal that has willingly chosen such a place for a home.

Lizards, three or four species, are abundant on the desert and around Paita. Snakes are very rare: foxes are not uncommon. Insects, with the exception of house flies and fleas (the latter in countless numbers), are scarce, but various moths, beetles, dragon flies, spiders, and a very few butterflies were observed. The above remarks apply to Paita and the surrounding desert. At Arenal, on the banks of the Chira, and all along that valley, the fauna is abundant and includes many birds.

It is not expected that there is anything especially novel or of great interest in these notes, but as the writer's residence at Paita was located on a rocky promontory jutting out into the sea, about three-quarters of a mile from the town and perhaps 40 feet above high water, he had an excellent opportunity to observe the sea birds during the fifteen months that he spent there and it is thought rather improbable that any ornithologist would be likely to spend as long a time in so uninteresting a spot. For these reasons some of the notes on the occurrence, relative abundance and habits of the birds may be of interest.

The writer does not claim to be scientifically familiar with the avifauna of that region but most of the birds are readily identified, and he has made frequent use of the excellent report by Mr. Robert E. Coker on the Guano Birds of Peru (Proc. U. S. Nat.

Mus. Vol. 56, pp. 449-511), which was the only publication available relating to the Peruvian avifauna.

Gulls and Terns: *Larus dominicanus*? Large "Gaviotas" or Gulls are by far the commonest sea-birds at Paita, where they share with the Buzzards the duty of scavengers along the beach. Mr. Coker, in his paper above referred to, speaks of two similar species *L. dominicanus* and *L. belcheri*, stating that the latter is easily distinguished by its smaller size, red-tipped bill and bright yellow feet and tarsi. I have little doubt but that those observed at Paita were all one species, *L. dominicanus*, but the coloration of bill, legs and feet differed considerably. All were approximately the same size; the upper side of wings, scapulars, and back were black, so that when wings are spread the entire upper side of the bird was black, except head, neck, tail and narrow stripe on anterior and posterior edges of wings, which were white. Entire underside of the body pure white. In most individuals the legs and feet were yellow, not very bright, but in a good many they were a dirty greenish color. Those with yellow legs and feet had a red spot near tip of under mandible but in those with greenish legs and feet the spot was black. These latter were probably young birds. Aside from these differences, all appeared to be exactly alike in size, color and habits.

These Gulls are apparently about equally common throughout the year at Paita. Numbers of them may be always seen along the shore, "policing" the beach with the Buzzards and perched on roofs of buildings. They are extremely tame and will permit one to approach within less than ten feet, often squabbling for offal around the feet of the person throwing it out, after the manner of poultry.

L. modestus: This species, known as "Mateo," is often seen following the steamers in company with the preceding. Rarely seen at Paita except in July, August and September, when they are rather common. Noticed June 11 and 17 and September 28, 1921, and frequently between these dates. Usually seen along the beach, either on the sand or swimming close to shore, singly or occasionally two or three together, not as a rule associated with other birds. Very tame.

Several other species of Gulls were noticed but, except in one case, not near enough to identify or give a good description. On November 20, 1921, a flock of over 20 small Gulls were seen in the water and on the beach near our office. They were rather smaller than a Kittiwake, gray back, gray cap on back of head, white tail with black band at tip, black feet. This same species was abundant for a few days but was not seen at other times. On October 9, 1921, and several times thereafter, several small Gulls, about the same size and similar in general appearance to the Bonaparte's Gull, were noticed but not near enough to give a good description. On November 22, I noticed several Gulls, rather larger than a Kittiwake, and apparently entirely white. They were on the wing and not near enough to observe details.

Terns are rarely seen at Paita. In July, 1921, a small Tern was noticed fishing off the mouth of a small sewer and on one or two other occasions terns were seen at a distance.

Gannets: Apparently *Sula variegata* is not often seen at Paita. I saw none that I could identify as that species, certainly none in the full plumage. All seen were the same size, very similar in plumage and habits, and were considered *S. nebouzi*. They were common during the summer and fall but comparatively rarely seen in winter. Only noticed twice in August (30 and 31), four times in September and three times in October. None were seen between September 28 and October 23. During the summer and until about July some were nearly always in sight but not in flocks, generally singly, flying along the beach or over the bay, fishing. Their habit of carrying the bill pointed down when thus engaged, is very characteristic and noticeable. They are very expert divers, dropping from the wing vertically into the water from as high as 100 feet. I have seen them dive from a height of 50 feet into water less than 2 feet deep. The suddenness with which their flight is often stopped and the vertical dive made is very remarkable. I never saw them dive except from the air, never from the surface of the water like the Cormorants. When they come to the surface after a dive they take to the air again almost immediately. So far as observed, most of their feeding is in shallow water and they commonly follow close to the shore in their cruising.

Cormorants: *Phalacrocorax bougainvillei* was not seen at Paita and *P. gaimardi* was not identified, though doubtless the latter and probably the former occur there. *P. vigua*, commonly called "Patillo" by the natives, is about equally common throughout the year. A few are almost always in sight. They are apparently not gregarious and are usually seen singly or occasionally two or three together; when perched on a rock or some part of a wharf several may often be seen together. They fly low and laboriously but in the water are very expert, often remaining beneath the surface nearly a minute, usually 30-40 seconds. I never saw them dive except from the surface of the water.

Pelicans: *Pelecanus thagus*. Very common at Paita during the summer. From early in November to the end of April some are always in sight during the day, on the water or flying, and many large flocks (30-40) are seen, especially late in the afternoon. During the winter they are much scarcer and there are no large flocks, but single birds or small groups of two or three, are seen.

On August 20, 1921, the first flock of any size, 12 or more, was noticed and nearly every day thereafter similar flocks were seen, generally late in the afternoon, flying in a S. W. direction, passing close to my house and across the tablazo back of the town. The number of birds in the flocks rapidly increased to over 25 before the close of August. These flocks did not stay around Paita and Pelicans fishing in the bay and harbor were not very common until November 1st. A very common method of fishing is to dive from a considerable height (40-50 feet) while on the wing, but the dive is not nearly as neatly executed as by the Gannets, and results in a great splash. The bird usually does not go completely under the surface of the water and after the dive commonly remains a short time on the surface before again taking to the wing.

They also spend much time lazily paddling around, often very close to the shore, and now and then picking up a fish. Never saw but one bird—a sick one—actually land on the beach at Paita but they occasionally perched on rocks along the shore. Although the large flocks habitually passed very close to my house, often within 10 feet or less of where I stood on the porch, when single birds or small groups were swimming close inshore,

they usually took to flight when a person, mounted or on foot, passed along the beach within less than 100 feet, and would often fly when the distance was even greater.

Man-of-War Birds: *Fregata* sp. These birds, known as "Tijeras" or "Tijeretas" to the natives, are common at Paita from the latter part of November to April or May, some being nearly always in sight. During the rest of the year they are scarcer but were observed every month in the year, viz: June 10, 1; July 24, 4; July 30, 3; July 31, 1; August 9, 3; August 18, 1; August 21, 3; August 26, 3; August 27, 3; August 30, 1; August 31, 1; often seen in September and October and noted on November 23 as "Abundant, 6 to 12 in sight most of the time." During the summer flocks of a dozen or more often passed close to my house after the manner of the Pelicans. In the spring of 1921 when the first of these flocks was noticed on September 28, when 8 birds were seen. I understand that but one species of this genus is found in the vicinity of Paita but several different plumages were noticed, viz: 1, all black with the exception of a bright red patch on the throat; 2, black with white head; 3, black with white head and breast, and 4, black, except the breast, which is white. The different plumages appeared to be about equally common. During the summer some were almost always visible sailing over the harbor, often at a great height so that they were scarcely more than specks in the sky. In fact, these birds were noticeable as flying much higher than others. I have frequently watched them for an hour or more at a time simply sailing around without any apparent object and making no attempt whatever to interfere with the Gulls or Gannets, which were industrially fishing. At such times the tail is kept closed and it is only when doing "stunts," or suddenly changing direction, that it is opened.

The Tijeretas very rarely flap their wings but almost invariably depend upon soaring, at which they excel any of the other birds unless it is the Buzzards. As flocks of them often passed within a short distance of me as I stood on the porch of my house, sometimes within 6 or 8 feet, I had an excellent opportunity of observing their methods of flight but was never able to discover how they, or any of the other birds, accomplished their wonderful soaring.

Although some were usually in sight all summer it was comparatively rare to see them pursue other birds to obtain their prey, but occasionally I have seen several Tijeretas unite in chasing a Gannet. On three different occasions I saw them fish for themselves. The first time was September 25, when I noticed a Tijereta sailing around a patch of water as if interested. He finally dropped down, hovered over the surface and picked up something of considerable size that he soon dropped with a splash. Again he tried and again dropped it. Meanwhile, another Tijereta and a couple of Gulls (*L. dominicanus*) came along and all four birds attempted to get the food. The Gulls soon settled on the water and remained there a long time but the tijeretas, after a few apparently unsuccessful attempts to carry it off, gave it up and flew away. I am unable to say positively whether the food was fish or something floating but think it was the former as the pieces looked white like shiny fish, and were of considerable size. The second occasion was on November 22. This time the Tijereta dove nearly vertically from quite a height, "flattening out" and grabbing the fish from the surface, but did not actually enter the water. Another one tried it but missed his fish. The following day I saw a similar case.

Shore Birds: Although there is an excellent sandy beach at Paita and crabs and various small crustacea are plentiful, shore birds are not, as a family, abundant, or even common, except for a brief time during migrations.

During the summer of 1920-21 Curlews (*Numenius hudsonicus*) were quite common and a flock of a dozen or more rested each day, at or near high tide, on a rock in front of my house. In the spring of 1921 the first Curlews were seen August 27, two being noticed; on September 24 another was observed, and on September 26 and 27 several; throughout October they were common.

During September and October, 1921, Sandpipers, Plover, and various species of beach birds were common, the first being noticed late in August. After November 20 few were seen. One species, similar in general appearance to our Turnstone, first appeared September 25 (20 or more in flock), were very abundant for a couple of weeks and were last seen October 25 (single bird). They had a conspicuous black spot on the breast and bright red legs

and feet. With them were a few very bright colored Sandpipers, similar in appearance to our Sanderling. In the latter part of October, and thereafter for about a month, large Plover with white tail and prominent black spot under the wings (only visible when flying) were quite common along the beach. Occasionally Plover were also seen on the tablazo. Throughout the year a small Sandpiper, similar to our Spotted Sandpiper, was occasionally seen but was not common.

Vultures: The Condor (*Vultur gryphus*) is occasionally seen about Paita and on the tablazo between there and the Chira river. On two occasions (Feb. ? and Sept. 26, 1921) I saw one perched on the extreme edge of the tablazo, about 3 or 4 miles from Paita. In each case the bird was very tame, so that the first time I rode within 25 or 30 feet and less than 20 feet the second time. Both birds (possibly the same individual in each case), were in excellent condition and plumage. A third specimen was seen in nearly the same place by one of my men. On August 27, 1921, I saw one flying past my house at Paita and on November 7 saw one flying over the tablazo about eight miles from Paita. In the two latter cases, as well as the first two, identification was positive, the white neck ruff being very plainly visible.

Turkey Buzzards or "Gallinazos" are, of course, very common at Paita, as at all the coast towns. There are two kinds, the "Blackheads" and the "Redheads," which I take to be *Coragyps foetus* and *Cathartes aura* respectively. Mr. Coker states that the former is the commoner near the cities, and that the latter is not only less numerous but more timid. According to my observations at Paita, they are equally common there and "timid" could not be properly applied to either of them. Of the two the "Redheads" are the more aggressive and often drive away the "Blackheads" and the Gulls from some piece of food. Both species are everywhere; along the beach, soaring over the bay and perched on buildings, flagpoles, telegraph poles and along the edge of the tablazo. If a burro gives out on the desert and is left to die (a pleasing native custom) he is at once surrounded by Buzzards. The smallest piece of fish or offal on the beach is at once found and eaten. They are omnipresent and it is well they are as their services are greatly needed. Apparently they have difficulty in

finding enough fresh water as they were often noticed drinking from the outlet of some small sewer and wherever there is a small leak in the pipe line which supplies Paita with water, which is pumped across the desert for 16 miles, there are sure to be several Buzzards waiting to catch it, drop by drop. One of their favorite perches is on the top of a flag or telegraph pole, and in such places they often assume a pose, with half spread wings, making a ridiculous caricature of the American Eagle as shown on our coat-of-arms. The buzzards are equally common throughout the year.

Hawks: A Sparrow Hawk, very similar to *Falco sparverius*, was occasionally seen on the tablazo and once or twice at Paita. They are fairly common in the Chira valley. Larger Hawks, about the size of a Red-tail, were seen a few times on the tablazo but not at Paita itself.

Small Birds: The only small passerine birds at all common in the vicinity of Paita, are a small Swallow and a warbler-like bird, very terrestrial in its habits. The Swallows are black above and light below, and are not infrequently seen flying along the edge of the tablazo or perched on telephone wires nearby. I judge that they nest in the face of the tablazo cliffs. Occasionally I have seen them in Paita but they are rare there. Do not recall seeing any during the winter and the first note of their appearance is September 22, one on tablazo; September 28, one in Paita; October 20, a flock of twenty or more on tablazo and on November 7, "Plenty."

The small warbler-like bird¹, which we commonly called "Desert-bird," I am unable to identify. They are about the size and in general appearance, except coloring, resemble a large Warbler, or about the size of an Oven-bird, but rather slenderer; gray or sand color above; very light (nearly white) below; black or very dark tail, when spread; under side of wings reddish; black, rather long, slender bill. The general coloration is such that they are scarcely noticeable among the sand of the desert. They are very terrestrial in their habits, quick in their motions and insectivorous in diet, often darting into the air for an insect. Very common over the entire tablazo and also around and in Paita

¹Probably *Geothlypis*.—R. C. Murphy.

itself, coming onto porches or doorsteps for food. They are equally common throughout the year.

No other small land birds were seen at Paita except one small Hummingbird, around my own house in the middle of winter, July 5, 1921.

A species of Mockingbird is very common in the Chira valley and usually one or two were seen in a small clump of bushes on the tablazo, where there had been a leak in the water main, about 5 and a half miles from Paita. None were seen nearer to Paita except in cages. They are often kept as cage birds by the natives.

DESCRIPTION OF TWO APPARENTLY NEW FORMS OF AEGITHALOS CAUDATUS FROM JAPAN AND KOREA.

BY NAGAMICHI KURODA, H. F. A. O. U.

THE following two forms of the Long-tailed Titmice from Japan and Korea are apparently undescribed:

***Aegithalos caudatus shimokoriyamae*, subsp. nov.**

Diagnosis.—Similar to *Aeg. caudatus trivirgatus* of Hondo, Japan, but it may be distinguished by the wing being longer (60–67 mm. instead of 56–62 mm.), the tail distinctly longer (80–91.5 mm. instead of 68–81.5 mm.), and by the chest-spots being blackish and very distinct.

Type.—Adult male, Koryo, Keiki district in Central Korea, October 15, 1917. N. Toda coll. My coll. No. 3808. The type specimen was presented to me by Mr. S. Shimokoriyama of the Seoul Museum, for whom the form is named.

Habitat.—Probably confined to the Korean Peninsula and the Island of Tsushima where it is a common resident. It is probably found also on Quelpart Island, south of Korea.

Measurements.—4 ♂♂ (Korea) wing, 63–67; tail, 85.9–91.5; tarsus, 17–17.5; culmen 7–7.5 mm.

2 ♀♀ (Korea) wing, 60, 62.5; tail, 80, 90; tarsus, 17, 17 mm.; culmen, 7, 7.5 mm.

4 ♂♂ (Tsushima) wing, 60.5–62; tail, 81–85.5; tarsus, 16–17.5; culmen, 7–7.5 mm.

4 ♀♀ (Tsushima) wing, 57.5–61.5; tail, 80–83.5; tarsus, 15.5–17; culmen, 6.5–7 mm.

Type.—wing, 65; tail, 91.5; tarsus, 17; culmen, 7 mm.

I have examined six adults and two young from Korea and eight adults from Tsushima, with the following results.

(I). The specimens from Tsushima and Korea are quite similar, all having the tail very long and distinct black bands on the sides of crown and the dusky chest-spots very clear, while the latter spots are very faint or wanting in my series of *trivirgatus* from Hondo, Japan. The wing of *shimokoriyamae* is on an average longer than that of *trivirgatus*.

(II). The young (σ^7 juv., Seoul Museum No. 1882) is almost the same as that of the Hondo form, in both the brownish band on the sides of crown becomes distinctly black on the anterior part, while in the young of *caudatus* (Clark's *magna* of Korea) the band is uniform pale brownish.

***Aegithalos caudatus kiusiuensis*, subsp. nov.**

Diagnosis.—Very similar to *Aeg. caudatus trivirgatus* of Hondo, Japan, but wing (54–57.5 mm. instead of 56–62 mm.), tail (65–74.5 mm. instead of 68–81.5 mm.) on an average shorter and tarsus (15–17 mm. instead of 15.5–17.5 mm.), a little shorter; the dusky chest spots usually nearly obsolete.

Type.—Adult male, Imazu, Prov. Chikuzen, N. Kiusiu, September 10, 1918. N. Kuroda coll. My coll. No. 3737.

Habitat.—It ranges from Shikoku (Prov. Tosa) over the whole island of Kiusiu in distribution.

Measurements.—2 ♀♀ (Prov. Tosa, Shikoku) wing, 57, 57; tail, 68, 74.5; tarsus, 16, 16; culmen, 7.5, 7.5 mm.

5 ♂♂ (North and South Kiusiu) wing, 56.5–57.5; tail, 70–74; tarsus, 15.5–17; culmen, 7–8 mm.

7 ♀♀ (North and South Kiusiu) wing, 54–55.5; tail, 65–70; tarsus, 15–16.5; culmen, 7–8.5 mm.

Type.—wing, 57; tail, 70; tarsus, 16.5; culmen, 7.5 mm.

I have examined nine specimens from Prov. Chikuzen, one from Prov. Hiuga, two from Prov. Satsuma and two from Prov. Tosa, Shikoku, with the following result:—

The dusky chest spots are usually more indistinct than in *trivirgatus*. In the five specimens (two from Shikoku, two from Chikuzen and one from Satsuma), the spots on the chest are nearly obsolete.

NESTING OF THE EVENING GROSBEAK IN NORTHERN MICHIGAN.

J. STOKLEY LIGON.

Plate XVIII.

THE breeding range of the typical form of the Evening Grosbeak (*Hesperiphona vespertina vespertina*) is at present very imperfectly known. There are records of birds seen in summer in Alberta, Manitoba, Minnesota, and extreme western Ontario, and of young not yet fully fledged in both Alberta and Manitoba; but the only fully authentic nest found is one discovered by Mr. S. S. Stansell about thirty miles northwest of Edmonton, Alberta. The writer's discovery of five nests of this species in northern Michigan is therefore of much interest.

Evening Grosbeaks are found to be fairly common in favored sections of Michigan in fall, winter, and early spring, but disappear with the approach of the nesting season. Flocks of these forest dwellers were observed in November, 1920, in the Taquamenaw River district, Northern Peninsula of Michigan, to which locality they were evidently attracted by the heavy beech mast. The birds were generally observed earnestly feeding in the top branches of the hardwood trees. Observation and inquiry in the summer of 1921 gave no hope of finding the birds nesting, and it was, therefore, an agreeable surprise when, in July, 1922, a nesting colony was located on Whitefish Point, Lake Superior, about 20 miles from the Canadian shore.

It is fitting that a place so far-famed as Whitefish Point should be selected as a nesting place by these elusive wanderers, but from available information it seems that they had never before, during the recollection of present inhabitants, so favored it. The site chosen is an impressive and interesting one and truly in harmony with the beauty and dignity of the birds. The beauty of the northern woods, especially where the white pine grew, has been greatly impaired by lumbering, not only as a result of the removal of the trees, but because, where extensive lumbering was done, forest fires invariably followed the logging. It is not improbable that the cutting of the pines influenced the birds that might have

previously nested there to abandon the region in favor of more suitable conditions farther north; or may we hope that they are extending their breeding range, as other species are doing in the same region?

The white pine grove proper, where the birds were nesting, covers little more than an acre of ground and is situated only a few hundred feet from the roaring waves of Lake Superior; while Norway pines fill in the gap and extend the grove to the very shores of the lake. Adjacent to the west for some distance is a scattered growth of small jack pines, and to the eastward and southeastward the land is a little more broken, and largely covered at the present time, by a new growth of hardwood and conifers. In winter, this spot is one of the coldest places throughout the Northeast, and the summers are always cool.

Upon reaching the grove late in the afternoon of July 28, my attention was attracted by the familiar whistle of the Grosbeaks. A friend advised me that the birds were nesting in the grove. Search was immediately begun for nests and five were located, four in white pines and one in a Norway pine. No effort was made to examine three of the nests, as they were difficult of access, high up and well out toward the ends of frail limbs. It was evident that the young were out of most of the nests. The muffled note of a bird, evidently that of one of the young Grosbeaks, attracted my attention. The little invalid, as it proved to be, was located on the ground, in the rank weeds underneath one of the nests. As it was approached the female bird showed up and nervously hopped and flew from limb to limb uttering the clear, pleading whistle common to the species. The nest from which the young birds had fallen was about 25 feet up on a horizontal limb of a white pine, well concealed by small branches and needles. This particular young bird had been attacked probably by a red squirrel, either in the nest or after it had fallen to the ground, and the left wing was entirely eaten off.

As the writer climbed to the nest from which the young bird had fallen, another young of the same size left the nest and hopped off into the thick needles and branches of the tree. The parent bird became more concerned when the nest was approached and fussed about, barely out of reach. Three other Grosbeaks darted

in, alighting on a near-by tree, and displayed some interest in the situation but did not make any move to assist the parent bird in her efforts to defend the nest and young. After the writer returned to the ground the female bird again took up an attentive watch over the afflicted one, which had been placed on a branch of a small pine (see Plate XVIII).

The nest examined was practically indistinguishable from nests of the Black-headed Grosbeak of the West, being almost, if not quite, as frail of construction. The body of the nest was composed of hard, clean sticks and lined with black and brown hair-like rootlets, with a sprinkling of moss between the outer body and lining.

The other nest inspected was in a Norway pine that stood about fifty feet north of the tree that contained the nest just described. This nest was also about twenty-five feet from the ground near the drooping end of one of the lowest limbs on the tree. It contained three young almost ready to leave the nest. The young were not disturbed and no adult birds were near while the investigation of the nest was being made, the parents very likely being away at the time. No doubt there were more nests than were located, but the trees were rather dense while the evasive nature of the birds prevented any clue as to exact locations. It is probable that a dozen pairs were nesting in the grove. On July 29, a few Grosbeaks were observed in some white pines half a mile southeast of the grove, and it is likely that these trees also contained nests.

The strong tendency toward association previously noted in this species was manifest among the breeding birds. The dominant note was the clear whistle, although a low conversational twitter could be heard when several were together in the trees. Their action, as is always the case, was deliberate; from four to eight would appear without warning, dash into a tree, remain for a few minutes and disappear as suddenly, but generally with a warning note or two that the flight was to be resumed.

After leaving Whitefish Point, July 29, no more Evening Grosbeaks were seen, although the writer was almost constantly traveling through the wilder sections of the region, until September 16, when fifteen were observed on a telegraph wire, within a few rods of the depot, in the little village of Nestoria, Northern Peninsula of Michigan.



2. Young of Evening Grosbeak.

EVENING GROSBEAK.



1. Nesting Tree of Evening Grosbeak.

1850-51
1851-52
1852-53
1853-54
1854-55

GENERAL NOTES.

Little Auk at Sand Bridge, Southeastern Virginia.—On January 20, 1923, the day being cloudy and calm, temperature 24° Fahrenheit, we noticed a small bird in our yard quite near the house. We readily captured it and no one present being able to identify it I determined to send it, alive if possible, to the Biological Survey at Washington.

We attempted to feed it with duck food, pheasant food bread crumbs, seeds and the like, but it refused everything. We put food into its bill but it would not swallow it. It was very gentle, not at all frightened and rather liked being stroked. We put it in a tub of water and it enjoyed itself immensely and I think if we had known what food to float on the surface of the water the bird would have eaten it.

We did our best to keep it alive but on the third day it died, when we sent it up to the Biological Survey and I am now informed that the bird was the Dovekie or Little Auk, *Alle alle*.

The day after its capture we saw another nearby at our boat house, evidently far away from its northern home but we made no attempt to take it.—J. C. O'CONOR, 24 E. Thirty-third St., New York. N. Y.

Razor-billed Auk in North Carolina.—On January 29, 1923 Mr. Charles M. B. Cadwalader shot a female Razor-billed Auk (*Alca torda*) on Currituck Sound, N. C. The specimen is now in the collection of the Academy of Natural Sciences of Philadelphia—WITMER STONE, *Acad. Nat. Sci. Phila.*

Double-crested Cormorant at Waterford, N. Y.—On May 16, 1921, a Double-crested Cormorant (*Phalacrocorax d. dilophus*) was seen on the Mohawk River three miles west of Waterford, N. Y. The bird was seen clearly; first on the water, then in its peculiar flight. I am familiar with the Cormorants of the Atlantic coast and Florida.

Out of thirteen fall records given by Eaton (Birds of New York) two are from this same locality! Lansingburgh, November 13, 1879 and Troy, September 21, 1888. The three localities mentioned being only three miles apart—really one city.

The weather conditions were normal; clear, with a strong west wind.—EDGAR BEDELL, Waterford, N. Y.

Field Identification of Ducks.—Mr. Ludlow Griscom's 'Field Studies of the Anatidae,' in the last two numbers of 'The Auk,' are of great value and interest, but I venture to add two or three points that seem to me of value in the recognition of these birds in the field.

The female Merganser can be distinguished at a considerable distance from the female Red-breasted Merganser by the white throat patch or

"bib" which is clearly defined and pure white in the former, but indistinct and shading gradually into the darker color of the lower throat in the latter species. Mr. Griscom alludes to this but lays more stress on the color of the rest of the head and neck.

Mr. Griscom states that the greenish gloss of the Greater Scaup and the purplish gloss of the Lesser Scaup can be made out at a maximum distance of 100 feet. It is true that the heads and necks of these ducks usually look black, but, under favorable conditions with the sun full upon them, I have often distinguished these iridescent colors with eight power binoculars at many times that distance.

In the case of the Ring-necked Duck, I agree with Mr. Griscom that the chestnut ring is not a good field mark, as it does not contrast sharply with the other colors of the neck and is not seen at all unless the neck is stretched up. The markings on the bill are very characteristic, but I have found that the white triangle in front of the bend of the wing is also an excellent field mark, for this is lacking in the Lesser Scaup.

In the Barrow's Golden-eye the elongated crescentic white spots on the head of the adult male are, of course, diagnostic, but this bird can be distinguished at a great distance from the American Golden-eye, by the fact that, while the latter bird shows a great deal of white on the wings and flanks as it swims on the water, the Barrow's Golden-eye looks dark in comparison, as there are only four or five white spots or squares on the wing coverts. I have picked out the latter bird at a considerable distance with the naked eye, in a flock of American Golden-eyes, by this method and subsequently confirmed the diagnosis by studying the markings, on the side of the head. The bill of the Barrow's is noticeably smaller and the feet, which may be seen under favorable conditions, are pale yellow and not orange-colored as in the adult male American Golden-eye.

The study of the Scoters' varying plumages is a long and fascinating one and, at times, a confusing one. For example, in certain plumages the Surf Scoter may have a white lower breast and belly and black head and upper breast, and suggest a Scaup. On the other hand this species may suggest an American Scoter by having full black plumage lacking the white brow and nape spots, or the latter may alone show very faintly only when the bird stretches its neck. The color of the bill distinguishes the two species. White-winged Scoters, although usually showing a little white on the wing when swimming on the water, may so dispose the wings that this is invisible even at close range and the distinction from the American Scoter must be made by the white spot under the eye of the White-winged and the red rather than the yellow bill.

Most of these points are to be found in *Memoir III* and *Memoir IV* of the Nuttall Ornithological Club, 'The Birds of Essex County,' 1905, and the 'Supplement' 1920.—CHARLES W. TOWNSEND, 98 Pinckney St., Boston.

Blue Geese Alighting in Northern Ohio.—On October 25, 1922, a very windy day, a flock of 25 Blue Geese stopped on a stretch of sandy beach at Lake Erie and before they could get under way again two hunters secured five of them. Later the writer took a photograph of the head and wings of a fine adult that had been nailed to a barn door. These birds seldom stop on their journey from the Hudson Bay district to their winter home in Louisiana, but according to a Cleveland newspaper, both the Blue and Snow Geese stopped this fall, near Sandusky also, and several were shot in that locality.—E. O. DOOLITTLE, Painesville, Ohio.

Subdivisions of the Little Black Rail (*Creciscus jamaicensis jamaicensis*).—In the January, 1923, 'Auk' pages 88-90 Mr. Henry K. Coale has described the bird from eastern North America as a distinct subspecies and named it *Creciscus jamaicensis stoddardi*, based on shorter and more slender bill and with shorter middle toe and claw, while the white markings on the upper parts are larger than in the bird from Jamaica described by Gmelin. Mr. Coale has examined three specimens from Jamaica none of which are quite perfect.

As soon as I looked at the plate of the three birds represented by Mr. Coale I knew I had in my collection a specimen taken by me on this plantation on September 13, 1899, that would match the Jamaica bird perfectly. I hastily unpacked the box in which the specimen had been placed for nearly 24 years and made a careful comparison with the following result: Culmen 16 mm.; middle toe with claw 29 mm. The white markings on the back are very small, in fact minute. This bird is an adult male in fine fresh unworn plumage, and is furthermore the most magnificent specimen I have ever seen or taken. While I have never seen a specimen from Jamaica this bird taken on Sept. 13, 1899, matches the plate of the bird from Jamaica minutely as regards the size and shape of the bill, while the measurements of the middle toe and claw fall short by just one mm. which is a microscopic difference. There can be little if any doubt that the Jamaica bird is the same as the bird found and known to breed in eastern North America. Mr. Coale does not mention the size of the bill of the sexes, but in the male the bill is larger than in the female. I have taken in the past six Black Rails on this plantation, only one of which I now have. But if anyone is interested in a critical study of this bird I will be glad to give further information of the five remaining birds. The description of the nest and eggs of the Black Rail was published by me in 'The Warbler' in 1905, not 1915 as stated by Mr. Coale in his article.—ARTHUR T. WAYNE, Mount Pleasant, S. C.

Some Wisconsin Shore-bird Records. *Phalaropus fulicarius*.
RED PHALAROPE.—A single specimen of this species was collected by the writer at the mouth of Bar Creek, a sluggish stream flowing into Lake Michigan opposite Cedar Grove, Sheboygan County, on October 8, 1921. This specimen, now No. 13299 of the Milwaukee Public Museum's col-

lection, is a male nearly changed to winter dress. The lake was very rough at the time, which may have caused the bird to seek shelter in this lagoon-like stream. It was very restless although not shy. While under observation it swam gracefully on the water, frequently making short flights out over the lake as well.

Although generally classed as a rare migrant in the Great Lakes region, extended work well off shore might prove it otherwise, for comparatively little work seems to have been done in this difficult field.

Lobipes lobatus. NORTHERN PHALAROPE.—Occasionally in August and September of past years large flocks of small shore-birds have been seen a long way off shore in the sand dune region of southern Lake Michigan, circling and wheeling, flashing alternately snow white breasts and darker backs. Long range examination with binoculars showed rather prominent whitish wing bars, but the identity of the birds was never satisfactorily determined until the afternoon of August 28, 1921, when the writer was camping at the mouth of the above mentioned Bar Creek, in Sheboygan County, Wisconsin.

About two o'clock in the afternoon a light fog drifted in, and soon after large numbers of small shorebirds, similar in actions and appearance to those mentioned, were sighted executing extraordinary manouvers close to the surface of the water about five hundred yards out. They circled and recircled, turned and twisted, some of the flocks finally alighting in some smooth streaks in the water, inshore of a long line of net stakes that extended about a mile out. Fully five hundred of the birds, now recognised as Phalaropes, were in sight. One specimen, a female in fall plumage was finally secured by tying the shotgun onto drift-wood pieces and swimming out among them. They were in no way disturbed at my presence until a shot was fired, and I fully satisfied myself that the bulk of the flock were of the same species as the one secured, Northern Phalaropes. Swimming high and lightly, with heads and tails well elevated and necks gracefully arched, they spun and twisted as only Phalaropes can, while they fed on minute surface animals of some kind. Scattered here and there among them, and creating the illusion of giants of their own kind, due to the very similar general coloration in their immature and fall plumages, and almost identical carriage, were a few dozen Bonaparte's Gulls. Another immature female Northern Phalarope was taken by the writer on September 23, 1922, also at the mouth of Bar Creek.

From these experiences it seems reasonable to conclude that these Phalaropes are of regular occurrence in considerable numbers on Lake Michigan in autumn. Due to their maritime habits at this season they are only occasionally observed under exceptional weather conditions inshore and on the smaller inland lakes, where they are very likely simply stragglers. Mr. Charles Brandler of Milwaukee recently informed me that he one morning observed a small flock of Phalaropes, supposedly of this species, swimming about near the end of the long Government pier at Milwaukee.

A very interesting record is that of an adult female Northern Palarope in almost perfect summer dress, taken June 5, 1922, by Mr. Owen Gromme of the Museum, on the shores of Lake Winnebago, at Fond du Lac Wis. It was in the company of a single Wilsons' Phalarope when shot.

Recurvirostra americana. AVOCET.—Kumlein and Hollister¹ list a number of records of the capture of this peculiar wader in the state, the latest in 1879, when they bred in Green Bay. As far as known none have been recorded since so that the following should be of interest. There is a male, No. 9061 of the Museum's collection, taken September 7, 1908, on Horicon Marsh, Dodge County, and presented by L. F. Crosby.

Another specimen, a beautiful male, was killed on Partridge Lake, Waupaca County, October 21, 1921, and presented to the Museum by Mr. H. J. Nunnemacher of Milwaukee. This specimen is now mounted.

The bird, which was mistaken for a Greater Yellow-legs, was seen to circle the lake a number of times, finally dropping in among some Canvas-back decoys, where it was swimming when shot.

Micropalama himantopus. STILT SANDPIPER.—A male was collected at the mouth of Bar Creek, near Cedar Grove, Sheboygan County, August 13, 1921. This bird was in the company of a Yellow-legs, which it followed here and there, always keeping slightly behind, where its actions and manner of feeding were noticeably different from those of its companion. This is the only Stilt Sandpiper so far observed by the writer on the Lake Michigan beaches.

Limosa haemastica. HUDSONIAN GODWIT.—There is a female specimen of this Godwit, No. 10032 of the Museum's collection, that was collected and presented by Mr. A. J. Schoenebeck. This bird was taken at Little Tail, Brown County, Wis., June 1, 1910. This is one of the many large waders that have almost disappeared from this region.

Numenius hudsonicus. HUDSONIAN CURLEW.—A fine female of this rare Wisconsin species was collected on the Lake Michigan shore a short distance south of Cedar Grove, Sheboygan County, September 23, 1922, by Mr. Owen Gromme and the writer. The bird was alone. There is a mounted specimen of this Curlew, No. 7034 of the Museum's collection, also an immature female, that was taken at Milwaukee on September 9, 1903, and presented to the Museum by Mr. John Kugler. H. L. STODDARD, Public Museum, Milwaukee, Wis.

Dr. Blagden on the Heath Hen.—The letters written from North America by Dr. Charles Blagden, a medical officer in the British Army then engaged in the task of bringing back the rebellious 13 colonies to their allegiance to the mother country, to Joseph Banks, his brother fellow of the Royal Society, are notable in many ways. There is much comment on the politics of the day; and it is evident that Blagden has little hope

¹ 'Birds of Wisconsin' by L. Kumlein and N. Hollister, Bull. Wis. Nat. Hist. Soc., Vol. 2, Nos. 1, 2, and 3, 1903, p42.

that the British Arms will triumph in the strife with "Mr." Washington and the "rebels." But the chief interest attaching to these letters, at least from the standpoint of a naturalist, is the frequent mention of natural history subjects. Dr. Blagden worked chiefly along lines of physical research. Many of his physical papers may be found in the 'Philosophical Transactions' and he also published papers on medical subjects. But all branches of natural science interested him. Hence the frequent communications on natural history subjects (plants, birds, fishes, etc.) to his friend Banks to whom he also sent natural history material of all sorts.

Sir Charles Blagden was a good deal of a figure in his day—1748-1820. He was in the British Army as medical officer for a number of years and remained in the service until 1814 when he was in Paris with the allied forces at the time of the abdication of the Emperor Napoleon. He became a fellow of the Royal Society in 1772 and in 1784 he was elected its secretary which office he held for a number of years. Dr. Johnson, as quoted by Boswell, speaking in true "Johnsoneese" of Blagden's copiousness and precision of communication, avers that "Blagden, sir, is a delightful fellow;" while Hannah More said that he was so modest, so sensible and so knowing that he fitted perfectly Pope's line: "Willing to teach and yet not proud to know."

Blagden enjoyed for 50 years the friendship of Sir Joseph Banks who was knighted in 1781. The most interesting of his American letters to Banks is undoubtedly that dated at New York, Dec. 24, 1778, from the fact that he describes therein the Heath Hen and its habits. This is almost the first *scientific* communication in regard to this nearly extinct fowl which a century ago enjoyed a broad distribution along the Atlantic seaboard, very unlike its present restricted habitat on the island of Martha's Vineyard. It is of interest to know that the letter was dated less than a month after the election of Banks to the presidency of the Royal Society which office this "munificent patron of science" held until his death in 1820, the year also of Blagden's demise.

The letter follows:—

New York, Dec. 24, 1778.

My dear Friend

The October Packet is at length arrived, and I must confess it was no small disappointment to me not to receive by it a letter from you, as it is now above half a year since I had that Honour. Though I have already written you one letter by this Fleet, yet, as some new matter has occurred, I cannot refrain from addressing you again. I had lately an opportunity of seeing a bird much celebrated among the Aldermen of this town, and learning some particulars of its natural history. It is the *Tetra Cupido* of Linnaeus called here the Grouse. The distinguishing character of this species, its projecting feathers on each side of the upper part of the neck resembling small wings, are said to be peculiar to the male, and to give

him a very singular appearance in his flight. The Grouse are hatched in July, and attain their full growth about 20th of September, though the private regulations of the Province used to restrain the shooting them till the beginning of October. They are found among shrub oaks, and in considerable plenty on Long Island about 40 miles from this town, on a part of the dry flat barren country there, called the brushy Plains, on account of the great number of these low scrubbed oaks which grow there. You must already know the singular circumstances of Long Island compared with the rest of this country, that the middle of it is formed into a pretty uniform Plain of great extent, on which no trees appear ever to have grown, called Hampstead Plains. This champaign country terminates eastward in woods, but gradually, and the gradation is made by these brushy oaks, among which the Grouse reside. They are hunted by Pointers, the best of which for this purpose are of a very large size, so as to be able to make good their way among and over the infinitude of shrubs with which the country is covered. These birds are said to be much more delicate after the winter is set in; it is however, scarcely possible to catch them then but by chance, in a snow-storm, when they sometimes come near the Farmers' houses settled there for shelter, and are shot with the guns which these people always keep loaded for that purpose. I have inclosed you a specimen of the feather, to shew in what manner it is doubled, or lined, for the greater warmth of the bird. Toward the basis of the rachis of the great feather, the supradecomposition not beginning very near the rachis, the plumage of the feather is hollow, and would be cold, if a smaller internal feather, arising from the same quill, and remarkably downy, did not fill up this defective place.

Winter is fairly begun, and with unusual severity. This morning near half an hour after sunrise, the Thermometer was rather below zero, whereas I never found it before lower than -4° . Though this may be a good remedy after the accursed sultry summers, it is certainly a very rough one, and I think our health might be as well restored by a more moderate prescription.

Your most affectionate Friend

C. Blagden.

—J. A. FARLEY, 52 Cedar St., Malden, Mass.

Bobwhite (*Colinus virginianus virginianus*) Increasing in Ohio.

—The Ohio Christmas bird census of 1915 as published in 1916 Jan.-Feb 'Bird-Lore' was the first Ohio census following the enforcement of the State law which gave permanent protection to *Colinus virginianus virginianus* from gun and dog.

This census consists of reports of fourteen Ohio observers from widely separated and generally representative parts of the State, and it develops the fact that the report of but one observer, Lutea E. Roades, Hillsboro, O. includes the Bob-White—fourteen birds. This equaled an average of one Bob-White to each observer.

Now after seven years of protection for this bird, the 1922 Ohio Christmas census as published in the 1923 Jan.-Feb. 'Bird-Lore' ought to reveal something one way or the other. It does. It shows that twelve of the seventeen Ohio observers from widely separated and representative parts of the State report seeing Bob-Whites to the total of eight hundred and fifty birds. That is an average of fifty birds to each observer.

These outstanding facts are accessible to anyone who cares to look them up. The point is—this is good material for those protectionists of any State, who are endeavoring to rescue the game birds from slow extermination by gun and dog. Likewise these are stubborn and pertinent facts to be faced and weighed in the dark, by advocates of "shoot 'em" to prevent inter-breeding, thereby maintaining a strong stock capable of raising large covies.—EUGENE SWOPE, Cincinnati, Ohio.

An Additional Record for the Extinct Porto Rican Quail-Dove.—In a small collection of animal bones taken by Mr. Rafael Vidal from a kitchen midden site at what is called the "Mesa" hill near Mayagüez, Porto Rico, is a left metatarsus of *Oreopeleia larva* Wetmore, a Quail-dove described originally (Proc. Biol. Soc. Washington, vol. 33, Dec. 30, 1920, p. 79) from cavern deposits near Morovís and Utuado. The present specimen is in a perfect state of preservation, better in fact than the metatarsus used as the type of the species, and agrees with other specimens in form. It has the following measurements: Total length 37.3 mm., smallest transverse diameter of shaft 2.7 mm., breadth of head 11.6 mm., breadth across trochlea 6.7 mm., depth through talon 6.2 mm. It is slightly shorter than four others from cave deposits which in length range 38.0 to 39.5 mm.

As Utuado and Morovís are both near the central part of the island the present find at Mayagüez near the west coast records the species at an entirely new locality. Other bird bones associated with *O. larva* at the new site represent the Green Heron (*Butorides virescens*) and Scaled Pigeon (*Patagioenas squamosa*). Further material from these deposits will be awaited with interest.—ALEXANDER WETMORE, U. S. Biological Survey, Washington, D. C.

Turkey Vultures in Alberta.—With two friends I made a trip on July 2, 1922, to Ministick Lake, which lies about 28 miles by road southeast of Edmonton. It is a bird sanctuary, and one of the interesting points is Heron Island, in the southern lake. Here for years a colony of the Great Blue Herons (*Ardea herodias herodias*) and the Double-crested Cormorant (*Phalacrocorax dilophus dilophus*) have been nesting together, and the cackle of the young can be heard for almost a mile, in calm weather. We were very interested on this occasion in observing five Turkey Vultures (*Cathartes aura septentrionalis*) on the island. For the couple of hours we were watching they remained perching on the tops of the trees, and so far as we could judge, lived on terms of perfect amity with their neighbors. There is no doubt in my mind of the identification, as it is vouched for

by two other ornithologists of greater experience than mine, including the Secretary of the Game Protective League, who lives in an island in the lake. I took two pictures at that time, one showing three, the other four of the Turkey Buzzards¹.—JAMES E. HORNING M. D., *Luscar, Alberta*.

The Gyrfalcon in Wisconsin.—The Milwaukee Public Museum recently obtained a fine specimen of the Gyrfalcon, *Falco rusticolus gyrfalco* from Mr. E. D. Ochsner of Prairie du Sac, Wis. The bird was shot by a farmer in Sauk County on October 22, 1916. Unfortunately it was not sexed but measurements indicate that it is a male. The specimen which has been mounted, is No. 13261 of the Museum's collection.

This form has not been previously recorded from Wisconsin, although the closely allied Gray Gyrfalcon has been taken once (Snyder, W. E., *Auk*, Vol. 22, 1905, p. 413).—H. L. STODDARD, *Public Museum, Milwaukee, Wis.*

What is *Buteo rufescens* Salvin and Godman?—In The *Auk* for January, 1922 (page 107) Mr. Ludlow Griscom asks the above question, and probably others have been more or less curious to know what the alleged species really is.

Although I have never seen the type, nor any other specimen labeled with that name, I have never had the least doubt that the specimens so called by Messrs. Salvin and Godman represent merely more richly colored examples of *Buteo borealis calurus*; that is to say, examples that are more or less intermediate between the lighter colored phase and the melanistic phase, and the name had been synonymized by me with the common western form of *B. borealis* in my manuscript of Part IX, 'Birds of North and Middle America.' Specimens agreeing with the characters assigned to *B. rufescens* occur in practically every collection containing a large series of specimens from the general range ascribed to the supposed new species. As Mr. Griscom suggests, however, it may include examples of *B. borealis alascensis*.—ROBERT RIDGWAY, *Olney, Illinois*.

Richardson's Owl (*Cryptoglaux funerea richardsoni*) In Cohasset, Mass.—It is a custom at our house to have breakfast before daylight on January mornings, near a row of windows outside of which, level with the sills, is a food shelf for birds. At one end of the shelf is a group of evergreen shrubbery; on the opposite end of the shelf stands an ordinary wire bird cage, which we use in our trapping and banding operations. Over the cage end of the shelf is a roof, with a clearance of nine inches between the top of the cage and the roof. Every morning we stock the shelf with a variety of bird food, and scatter more on the ground below and in front of the shelf. The birds begin to come before it is fully daylight, hence our habit is to reduce the electric light within the room to a minimum, and to keep it as far removed from the windows as possible.

¹ Photographs unmistakable.—Ed.

On the morning of January 11, 1923, the conditions described above prevailed, but there was an extraordinary depth of snow for our section. A succession of storms had left us with some fifteen inches of snow on the ground and all the trees and bushes heavily smothered in snow. Before 6.30, while it was still decidedly dusky without, Sparrows of several species, Juncos, etc., began dropping in at the feeding station until there were twenty or more on the ground below the shelf. As a light still glowed within the room, the birds were a little shy of the shelf itself. Suddenly, about 6.45, to our amazement, something large (for the space) plumped noiselessly down upon the top of the cage beneath the overhanging roof, close against the window. It was an Owl, rather a small Owl, with large round head, and he was peering over at the group of small birds beneath him, about four feet away. He swooped down upon them (not greatly to their alarm, it seemed to us), failed to capture any, and returned to the shelf. He perched with his back toward us again, but turned his face squarely around our way this time, owl-fashion. He seemed in some degree aware of our light and of our excited interest, but apparently could not really see my husband's face inside the glass, within five inches of his own! He plunged into the evergreens at the end of the shelf, and then for some reason fluttered against the adjoining window for several seconds—wings spread and lifted, feet dangling, before flying away across the yard toward a group of tall pines in a nearby woodland.

This unexcelled opportunity for studying the Owl from all points and in great detail at close range left no possible doubt that it was Richardson's Owl (*Cryptoglaux funerea richardsoni*) brought here presumably by the recent unusual weather conditions. While we have no mind to let him feed on the smaller regular visitors to our feeding station, we shall look with interest for his possible further appearance.

The notable blindness of this Owl, both in respect to the small birds and to ourselves, we credited to the increasing daylight and to our indoor light. It is especially characteristic of Richardson's Owl, as other observers have stated.—HELEN GRANGER WHITTLE, Cohasset, Mass.

Richardson's Owl in Michigan.—On December 20, 1922, a specimen of Richardson's Owl (*Cryptoglaux funerea richardsoni*) was brought to Dr. K. Christofferson and myself by a boy who had shot it the day before, in an old cemetery within the city limits. This is one of our rarest Owls. Two specimens are in our High School Museum, both collected about 20 years ago. We sent the bird to Prof. Barrows of our State Agricultural College.—M. J. MAGEE, Sault Ste. Marie, Mich.

Note on the Generic Name *Pteroptochos* Kittlitz.—The status of the generic name *Pteroptochos* Kittlitz (Mém. Acad. Imper. Sci. St. Petersb. Savans Etrangers, I, October, 1831, p. 178), is just like that of *Euscarthmus* Wied. elsewhere explained. It was originally proposed for the three species *Pteroptochos rubecula* Kittlitz, *Pteroptochos albicollis*

Kittlitz, and *Pteroptochos megapodius* Kittlitz, the last now known as *Hylactes megapodius*. It has been used for the group including *Pteroptochos rubecula* Kittlitz, which has been considered the type, evidently from Gray (List Gen. Birds, 1841, p. 25). The latter author, however, one year earlier (List Gen. Birds, 1840, p. 19) designated *Pteroptochos megapodius* Kittlitz as the type. Since this is apparently the earliest designation, the generic name *Pteroptochos* becomes a synonym of *Hylactes* King, and the group including *Pteroptochos rubecula* is without a name. It may, therefore, be called *Scelorchilus* (σκέλος, crus ὄρχιλος, regulus), with *Pteroptochos rubecula* Kittlitz as type. Its two species will consequently stand as *Scelorchilus rubecula* (Kittlitz), and *Scelorchilus albicollis* Kittlitz.—HARRY C. OBERHOLSER, U. S. Biological Survey, Washington, D. C.

The Generic Name *Euscarthmus* Wied.—In looking up the status of some South American genera of birds a year or two ago, the writer noticed that the generic name *Euscarthmus* Wied (Beiträge Naturg. Bras., III, Abt. 2, 1831, p. 945) was apparently misapplied. Further investigation confirmed this impression, and it seems now worth while to put the facts into print. The genus *Euscarthmus* was originally instituted for the following five species:

Euscarthmus meloryphus Wied=*Hapalocercus meloryphus* (Wied).

Euscarthmus nidipendulus Wied.

Euscarthmus superciliaris Wied=*Habrura pectoralis* (Vieillot).

Euscarthmus cinereicollis Wied=*Notorchilus auricularis* (Vieillot).

Euscarthmus orbitatus Wied.

The name has commonly been used for the group of which *Euscarthmus nidipendulus* Wied is the type; but Gray (List Gen. Birds, 1840, p. 32), who seems to have been the first author to designate its type, selected *Euscarthmus meloryphus* Wied, which is the currently accepted type of *Hapalocercus* Cabanis (Archiv. f. Naturg., XIII, pt. 1, Heft 2, 1847, p. 254). According to this the generic name *Euscarthmus* must be transferred to the group now called *Hapalocercus*, to displace the latter term as it is many years prior, and its type species known as *Euscarthmus meloryphus* Wied; while the group that has heretofore passed as *Euscarthmus*, being thus bereft of its only name, may be known as *Euscarthmornis* (εὐσκαρθμωσ, celeriter saliens; ὄρνις; avis), and the type species, *Euscarthmus nidipendulus* Wied, as *Euscarthmornis nidipendulus* (Wied).—HARRY C. OBERHOLSER, U. S. Biological Survey, Washington, D. C.

Crows Building in Low Willows.—We found a Crow's nest in a willow thicket about ten feet from the ground, on May 28, 1922. The situation surprised us, as the Crow usually builds very high, and there were high trees within a few hundred yards. We thought that the presence of an abundant food supply, in the shape of a dead cow, within twenty-

five yards may have been the reason for the choice of nesting site. We cut down the nest, which contained three eggs, newly laid, and photographed it, leaving it at not more than two feet from the ground, and inclined at an angle of about 55 degrees. We removed the eggs, as we had been urged to do by neighboring farmers and the Secretary of the Game Protective League. Judge of our surprise, on re-visiting the nest on June 1 to find four new eggs! These we also removed, and the Crows finally abandoned the nest. It seemed to us very unusual for the Crows to re-occupy the nest especially when so close to the ground and at such an angle.—JAMES E. HORNING, *Luscar, Alberta.*

The Mynah.—A Study in Adaptation.—One of the most interesting and, at the same time, abundant birds found in Fiji is the common or Indian Mynah (*Acridotheres tristis*) a member of the passerine family Sturnidae. This bird is a native throughout the entire Indian region and has been introduced into various parts of the world; the Hawaiian Islands, New Zealand and Fiji included, in all of which it breeds and thrives to an amazing degree.

While acting in the capacity of entomologist and ornithologist on the University of Iowa expedition to certain South Sea islands during the past summer opportunity was given me to see, study and collect examples of this fine appearing bird and the following paragraphs contain an account of my own observations.

The Mynah was introduced into Fiji several years ago in an attempt to control noxious insects. However, the results have been somewhat disappointing for it has not done the good which had been hoped for. Other food than noxious insects has been more easily secured; native birds are to some extent molested and their numbers more or less held in check by this thrifty, pugnacious bird; and the habitations of the people are made unsightly by it. Its habit of building nests in spoutings, chimneys and protected places of houses has not made many friends for the bird among the human population of the islands. So adaptive, resourceful, hardy and successful in maintaining its existence in the new country has the Mynah proved to be that now it, in turn, is considered a pest and is no longer lawfully protected.

Indeed, an interesting analogy prevails between the Asiatic people and the Fijians on the one hand and the Mynah and the native Fijian birds on the other. The hardier and more aggressive Chinese and Indians, the later introduced in great numbers into Fiji largely under the indenture plan of labor, are slowly but surely forcing down the Fijians who, though seemingly powerless to help the situation, hate the newcomers most heartily; the more so as they see business and property along with wealth and all that goes with it gradually coming into the power of the invaders. So it is with the hardy and aggressive Mynah as compared with the native birds. This crafty and quarrelsome introduced species stands back for no native bird and is gradually outstripping the native species in the

struggle for maintenance. The same condition prevails in the Hawaiian Islands and may become true in New Zealand.

The Mynah is a trimly built bird about ten inches in length with the upper parts, breast and sides brown, the head and neck black, the lower parts white and a white bar on the wings. The short blunt bill is yellow and there is a bare patch of yellow skin behind the eye. Mynahs are mainly terrestrial and gregarious; they have a considerable variety of notes and are great imitators. Their nests, loose bulky affairs, are sometimes placed on the branches of trees but more often in gutters and unused chimneys of houses, the birds partaking in this respect of some of the bad traits of the European House Sparrow.

Situated on the southeast side of the island of Viti Levu is Suva, the political capital and largest city in the Fijis. Here, Mynahs are plentiful and a nuisance about dwellings. The principal street known as Victoria Parade closely follows the contour of the beach where, at low tide, hundreds of the birds congregate, amid a great chattering, to feast on worms, molluscs, crustaceans and the like that have been temporarily stranded on the low mud flats by the receding tide. These aquatic forms are more abundant and more easily secured than most noxious insects on the island and the Mynah is not tardy in taking advantage of the situation.

About twelve miles northeast of Suva and four miles off shore is situated the little island of Makaluva upon which is located the Government Quarantine Station. On this bit of disintegrated coral about eight acres in area where temporary quarters were established by us Mynahs are common and a number were taken for specimens. The birds usually go about in small flocks and after once being shot at they become very wary and difficult of approach. When wounded they often fly some distance before coming down, sometimes alighting in the tops of the coconut palms where it is impossible to secure them.

Although apparently successful in the struggle for existence the battle is not always in favor of the Mynahs for they too have their enemies among which may be mentioned man and certain parasites. The prevalence of parasitism and the extraordinary degree to which it may be developed is well illustrated by one Mynah taken on June 19, 1922, which served as hosts for the following parasites: several thread worms between the conjunctiva and the cornea of the eye; both eyes were infested and more than a dozen worms each measuring from eight to ten mm. in length were taken from the two organs. Some of these worms have been submitted to Dr. B. H. Ransom, Chief of the Zoological Division of the Bureau of Animal Industry, United States Department of Agriculture, who pronounces them to be a species of *Oxyspirrura*, probably new, and adds that the Mynah forms a new host for representatives of the genus. In addition to these parasites this bird bore two small owl flies and two small biting lice. Eggs of the latter were also discovered and probably other individuals of all three types of parasites escaped observation.

Another bird examined contained a large round worm in the abdominal cavity. Other Mynahs were found to be infested with these parasites though none other examined was so markedly afflicted as the individual above mentioned.

Notwithstanding a considerable diversity among the major parasites, attacking them and the presence of other natural and unnatural enemies these vigorous birds not only survive but even seem to increase.

In conclusion, by way of summarizing, it may be stated that the factors which seem to contribute to the success of the Mynah when introduced into a new country are its audacity, hardihood, adaptability, wariness in eluding enemies, its omnivorous food habits and its selection of breeding places. After all, one can not help admiring this bird.—DAYTON STONER, *State University of Iowa, Iowa City, Ia.*

Spinus pinus macropterus, an Addition to the A. O. U. Check-List.—There are five specimens of *Spinus pinus* from San Pedro Martir, Lower California, in the collection of the Carnegie Museum, taken by Mr. A. W. Anthony in April, 1889, and May, 1893. These are obviously different from the common run of specimens and upon comparison prove to be referable to the Mexican race, *Spinus pinus macropterus*, with authentic examples of which they agree well, both in color and size. *S. p. macropterus* averages decidedly paler than *S. p. pinus* in the same condition of plumage, with the streaking less distinct. This record is a new one for Lower California, and brings *S. p. macropterus* within the scope the A. O. U. 'Check-List.' It involves a great extension of range for the form in question, with discontinuous distribution.—W. E. CLYDE TODD, *Carnegie Museum, Pittsburgh, Pa.*

Nesting of the Junco (*Junco hyemalis hyemalis*) in Southern Connecticut.—I was somewhat surprised to see a pair of Slate-colored Juncos June 5, 1922, at Hadlyme, and soon found their nest which contained four young and observed both parent birds feeding young.

Nest was in a ledge of dirt and sheet rock. A little of the dirt was dug out from between two layers of rock and the nest was built therein, composed of fine grasses. As this is the first record of their nesting in Connecticut to my knowledge, I thought it worth reporting. May 9, 1920 I found a nest and three young of the little Saw-whet Owl at Hadlyme.—ARTHUR W. BROCKWAY, *Hadlyme, Conn.*

A Dickcissel in Rhode Island in Winter.—On December 20, 1922, a Dickcissel was captured in my Sparrow trap at a bird banding station in Pawtuxet on Narragansett Bay, a few miles south of Providence, R. I. The bird was examined by Edward Howe Forbush who declared that the condition of claws and plumage indicated clearly that it was a wild bird rather than an escaped cagebird. The bird was then taken to Mr. Outram Bangs at the Peabody Museum and compared with skins. Mr. Bangs decided that it was a male bird and probably in its first winter plumage.

The only published record for the Dickcissel in Rhode Island is a bird shot by Lt. Wirt Robinson at Newport in 1888. This record is in Howe and Sturtevant's 'Birds of Rhode Island.' Unpublished accounts of the bird's occurrence in the state include a sight record by Dr. Herbert E. Walter, president of Rhode Island Audubon Society. He found a singing male on Neutaconkanut Hill on the outskirts of Providence "about ten years ago." He was familiar with the bird in the middle west prior to that time.

Our bird was first noticed by Mrs. Frederic H. Pember feeding with English Sparrows, December 18. Its tail was missing. With this mark and its yellow breast it was easily distinguished. It was taken in the government bird banders' sparrow trap December 20. The trap was placed on the ground and baited with the Audubon mixture of small seeds. The bird's gait was a little different from that of the Sparrow. This may have been caused in part by the absence of the tail feathers. Seeds were eaten in a slightly different manner also. During the first part of its confinement it was very restless but soon became accustomed to the large cage and appeared to be very comfortable when taken to Boston for a stay of four days. After its return to Pawtuxet it was released. It remained about the premises throughout the day feeding with other birds, walking about the porch, or seeking shelter beneath it. On the following day a heavy snowstorm came. The Dickcissel has not been seen since. It wears band number 28623.—HENRY E. CHILDS, 864 Broadway, East Providence, R. I.

Pseudospermestes not a Valid Genus.—In the classification of the Weaver-birds which I proposed in 1917,¹ *Pseudospermestes* was included on faith, and its systematic position was left in doubt, for although it was said to include two species, no figure had been published of them, and no specimen was contained in any museum of America or of England. The type of the genus was *P. goosensi* Dubois² from Kisantu, western Belgian Congo, of which the Berlin Museum was said to have a second example from Ossidinge, Cameroon.³ The other species assigned to the genus was *Pseudospermestes microrhyncha* Reichenow⁴ from Buddu on the west shore of Lake Victoria.

During the autumn of 1921 I had the opportunity of examining both types, but found that neither of them represented valid species. The type of *goosensi* is simply a young *Spermestes poensis* in the brown juvenal plumage. It is not a skin, but a dried mummy, with the tail not yet fully grown, and the remiges, too, with slight sheaths at their bases. At this stage the young of *poensis* is readily distinguishable from that of *cucullatus* by its much darker upper parts, though both of them differ

¹Bull. Am. Mus. Nat. Hist., XXXVII, 1917, p. 261.

²Ann. Mus. Congo, Zool., Ser. IV, Vol. I, fasc. 1, 1905, p. 16.

³Reichenow, Mitteilungen Zool. Mus. Berlin, V, 1911, p. 253.

⁴Orn. Mtsber., XXIV, 1916, p. 168.

widely from adults in coloration. The Berlin specimen of "*goosensi*" belongs to the same species, *poensis*, and is equally young, for all its wing and tail quills were still growing. Any peculiarities in the bills of these two specimens are attributable to the shrinking of the soft mandibles of fledglings.

In like manner, *Pseudospermestes microrhyncha* is based upon a type which is obviously in juvenal plumage, with wings and tail still showing sheaths at the bases of their quills. Its nondescript plumage is that which the young of *Vidua macroura* (= *serena*) wear when they have just emerged from the nest of their foster parents—for the species is known to be parasitic. To make sure, I compared it with another young Pin-tailed Whydah in the Berlin Museum. The bill of the type seemed unusually small and blackish, but the characteristic swellings on the skin of the gape were still noticeable.

I hold, therefore, that the genus *Pseudospermestes* has been erroneously established to include young stages of two species of Estrildinae already well known, and that it has no real existence in nature.—JAMES P. CHAPIN, *American Museum of Natural History*.

The Tree Swallow (*Iridoprocne bicolor*) Affected by Sudden Cold.
—Many instances have been reported of our insectivorous birds being seriously affected by severe and sudden falling of temperature, and thousands being benumbed beyond recovery in a very short period. In the 'Forest and Stream' of Dec. 6, 1888, I recorded an instance where the temperature, as late as May 11, dropped to 35° and 645 specimens of 22 species, mostly Warblers, were picked up dead. This was largely in the vicinity of Racine, Wis. This was, of course, a very small portion of the actual fatalities. I have seen hundreds of Tree Swallows that had collected on the bare limbs of dead trees bordering the Kankakee River at English Lake, Ind., so benumbed by an exceedingly cold night in early spring, that they were unable to take flight when I struck the limbs sharply with my paddle.

In looking over some correspondence from my late friend Edward Read of Cambridge, Mass., I find an interesting example of this Swallow being affected by sudden cold. In this letter he writes that while on a fishing trip at their camp on Grand Lake, Washington Co., Maine, the latter part of May 1906, they had an unusual cold spell and the temperature dropped as low as 30°. The next day they picked up a number of dead Tree Swallows on the beach and in the paths about camp.

One of the buildings was used for the cook house and the second story window was screened with wire. The heat of the building passing out through this open window was detected by the Swallows and late in the afternoon they noticed the screen covered solid with them, huddled together like a swarming of bees. One of the guides took a dip net and scooping it full took them into the house where they were kept warm until the following morning and then liberated.

It would be a difficult matter to estimate the thousands of birds that every year meet their death through many natural causes.—RUTHVEN DEANE, *Chicago, Ill.*

Northern Shrike (*Lanius borealis*) near Santa Fe, N. Mex.—December 18, 1922, I had a very interesting meeting with a Northern Shrike, which, by the way, is the first of this species I have seen in New Mexico.

For some time I have been trapping and banding birds, and have been using for that purpose a regulation government sparrow trap. At three o'clock in the afternoon of the date above mentioned, I visited a trap I had set out, and saw that it contained two birds—one an Intermediate Junco; the other a House Finch. I could see this from a distance of a hundred feet; also I observed that a Shrike was fluttering around the trap trying to attack the imprisoned birds. I watched it for several minutes. Finally it flew away, seemingly disgusted with its fruitless quest. The smaller birds I left in the trap in the hope that they might again attract the Shrike.

One hour later I again visited the trap and found the Shrike had returned and was working as hard as ever to find a way of entering the trap. It finally succeeded. I ran immediately to the trap to make sure of capturing him; also of saving the other birds. Upon my arrival I found both of the smaller birds dead, even though the Shrike had not been in the trap more than thirty seconds. The Junco was crowded into a corner of the trap and bleeding freely around the head. The Finch was lying on its back near the center of the trap with no visible sign of violence.

It took some time to entice the Shrike into the gathering cage, as the bird was very wild. After banding it I took the following measurements: Length, 10.50; wing, 4.65; tail, 4.70; bill, .55;

I believe this to be a bird raised last season, notwithstanding the fact that it was somewhat oversize. The Shrike is now No. 108285.—J. K. JENSEN, *Santa Fe, N. Mex.*

***Phyllanthus czarnikowi* O.-Grant** **Synonymous with *P. bohndorffi* (Sharpe).**—In the *Revue Zoologique Africaine*, IX, 1922, pp. 381-383, Mr. D. A. Bannerman expressed some doubt as to the distinctness of the two African Babblers named above. The genus *Phyllanthus* is so strikingly sylvan in habits that I, too, had wondered whether one form could occur just along the northern border of the Congo forest, at Sassa, and another in the same forest, from the Uelle River to Mawambi and Beni in the Upper Ituri district.

The type specimen of *bohndorffi*¹ was stated by Ogilvie-Grant to be a young bird; so in 1921 I took an immature specimen of *Phyllanthus*, collected at Banalia on the Aruwimi River, to the British Museum for

¹ Sharpe, *Journ. Lin. Soc. London, Zoology*, XVII, 1884, p. 422. (Sassa, Niam-Niam).

comparison with the type of *bohndorffi*. There was no difference in the distribution of gray, blackish, and rufous on the head and throat; and although the crown of the type of *bohndorffi* was faintly lighter, the distinction was too slight to be of even subspecific nature. Other young birds in our collection from the Ituri forest are similar to that from Banalia.

Adult birds from both Uelle and Ituri basins have more black about the face than in the young, the centers of their crown feathers are darker, and the chestnut plumage of the body is darker and richer. *Phyllanthus czarnikowi* O.-Grant,¹ being based merely upon these adult characters, is not a recognizable form.—JAMES P. CHAPIN, *American Museum of Natural History*.

Another Calaveras Warbler in Colorado.—The writer collected a second specimen for Colorado of this Warbler (*Vermivora rubricapilla gutturalis*) on the banks of Pine Creek just above its junction with the South Fork of the South Platte River on September 17, 1922. This locality is the site of the old town of Nighthawk, Colo., and is situated about fifteen miles in an air line from the area in which the writer found the first specimen of this subspecies collected in the State.—W. H. BERGTOLD, *Denver, Colo.*

Mockingbird in Winter in Lake Co., Ohio.—A record of the Mockingbird was made by the writer on the afternoon of January 28, 1923, as it sat at the edge of a dense thicket of hawthorn. My only other record for Lake Co. was made September 14, 1919. The bird was comparatively tame and my observations were made close enough for the white eyelids to be distinctly seen.—E. A. DOOLITTLE, *Painesville, Ohio*.

The Identity of Gmelin's *Todus plumbeus*.—It is remarkable that the name *Todus plumbeus* used by Gmelin (*Syst. Nat.*, I, (1), 1788, p. 444) for a small bird with very distinctive markings should have remained unidentified for more than a century and a quarter.

Gmelin compiled his diagnosis directly from the description of the third species in the text of *Todus leucocephalus* in Pallas' *'Spicilegium Zoologicum'*, Tom. I, Fasc. VI, 1769, p. 17, citing in addition to this the Plumbeous Tody of Latham (*Gen. Syn. Birds*, II, 1782, p. 661). But Latham drew his description from the same source, so that, everything considered, *Todus plumbeus* Gmelin is based wholly upon the bird described by Pallas, the identity of which must also, therefore, be that of Gmelin's entry.

Pallas (*l. c.*) described from a specimen said to have come from Surinam whence, as he says, collections of birds were frequently received. The original text is as follows:

"*Aliam, huic ultimae [Todus cinereus Linné] affinem speciem Surinamo accepi, quae rostri magnitudine et figura ad amussim fig. A. modo adle-*

¹ Bulletin Brit. Orn. Club, XIX, 1907, p. 40 (Mawambi, Ituri).

gatam refert, adeoque hac parte *Todus cinereum* aequat, quamquam ipsa mole minor et vix *Regulo* par sit. Color illi supra plumbeo-canus, versus verticem sensim nigricans; subtus a gula ad caudam lacteus; Pennarum volaticarum autem, remigum scilicet et rectricum fere niger, marginibus externis remigum et tectricum secundariorum, itemque rectricum laterali in cauda aequali albis."

It should be noted that although Pallas assigned the species to the genus *Todus* of Linné, he called particular attention to the less massive bill ("ipsa mole minor"), not quite like that of the Wren ("vix *Regulo* par sit"). But Gmelin and Latham, both ignoring this modification in the shape of the bill distinguishing it from that of *Todus cinereus*, placed the species in *Todus*, thereby effectually concealing its identity.

Pallas' description agrees perfectly with Buffon's Gnatcatcher to which the name *Poliophtila livida* (Gmelin) (Syst. Nat., I, (2), 1789, p. 981) has been applied. This species bears a superficial resemblance to *Todus cinereus* Linné (= *Todirostrum cinereum*), and is of about the same size. The bill is long like that of *Todirostrum*, wide at the base, but more slender, more compressed toward the tip, but not nearly so much as in the Wren (*Troglodytes*). The upper parts are bluish gray; head darker or dusky in the female or immature male, black in the adult male; under parts entirely white; wings dusky black with white inner margins to the primaries and white outer margins to the secondaries and secondary coverts; central pair of tail feathers entirely black, the others tipped or margined with white, the outermost pair almost entirely white, the base only being black.

It is, I think, sufficiently clear that Pallas' description, and hence Gmelin's *Todus plumbeus*, applies to this species which, on the grounds of anteriority, must henceforth be known as *Poliophtila plumbea* (Gmelin) instead of *Poliophtila livida* (Gmelin).

The two Guiana forms are thus:

Poliophtila plumbea plumbea (Gmelin)

Poliophtila plumbea innotata Hellmayr.

By this disposition of *Todus plumbeus* Gmelin, a further correction in nomenclature becomes necessary, affecting the name of the Plumbeous Gnatcatcher originally described by Baird (Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 118) under the name *Culicivora plumbea* and subsequently known as *Poliophtila plumbea* (Baird). This combination now being preoccupied by *Poliophtila plumbea* (Gmelin) is no longer tenable, and hence the name of Baird's Plumbeous Gnatcatcher automatically becomes *Poliophtila melanura* Lawrence (Ann. Lyc. Nat. Hist. N. Y., VI, 1858, p. 168).—THOMAS E. PENARD, *Museum Comp. Zool., Cambridge, Mass.*

Red-breasted Nuthatch, (*Sitta canadensis*), Breeding on Long Island, N. Y.—June 15, 1921, at Orient, Long Island, I took a female Red-breasted Nuthatch, believing it to be a late spring migration record for the locality. On examination the specimen proved to be a breeding bird.

The ovary contained the ruptured capsules from which the eggs had been developed. The breast was denuded of feathers and the skin thereon had not yet changed from the thickened and swollen condition of incubation. The bird evidently had eggs or young in the vicinity of Orient. The bird was collected about six a. m. in an orchard isolated from other woods. The nearest wood was red cedar, *Juniperus*, two-hundred yards south. A search for the mate was undertaken in a surrounding circle and on June 18 a male was discovered in a dilapidated orchard half a mile north. A male of this species was observed thereafter in that vicinity throughout the month of June and into July.

This species has been recorded, preceding this record, as late as May 30, in Orient. Records to May 25 are frequent. These late spring records, with the almost regular occurrence from mid-July on through August, of individuals, recorded as early south-bound transients, lead to the conclusion that this species may be a regular, though very rare, summer resident on the east end of the north shore of Long Island.

Notes of the Red-breasted Nuthatch were heard in Orient on July 12, 1922. The species apparently rarely wanders far from a certain station while here in summer. —ROY LATHAM, *Orient, Long Island, N. Y.*

Notes on New York Birds.—Among the birds received at the New York State Museum during the winter from various New York localities are some that seem worthy of record. Unless otherwise noted the specimens are preserved in the collections of the museum.

Colymbus holboelli (Reinhardt). HOLBOELL'S GREBE, (female).—Found alive, but with the feet frozen, at the Rensselaer Rifle Range, Rensselaer, New York, Feb. 23, 1923, by Mr. Paul Harter and brought to the State Museum. The bird was placed in an aquarium and fed for several days on fish and small salamanders. Died Feb. 27th.

Alca torda (Linn.). RAZOR-BILLED AUK.—Picked up dead on the beach at East Hampton. L. I., Jan. 23, 1923, after a cold northeast storm, and sent to the museum by Mr. James Douglas. The feathers were matted together by oil and greatly discolored.

Botaurus lentiginosus (Montgu). BITTERN.—Caught in a trap set for mink by Mr. N. A. Francis, Chatham, N. Y., Dec. 28, 1922. The specimen was mounted for the owner by Mr. A. Paladin, taxidermist for the museum.

Gallinago delicata (Ord). WILSON'S SNIFE.—Found in a mink trap Dec. 22, 1922, near Prospect Heights, Rensselaer county, and mounted by A. Paladin for the owner.

Cryptoglaux funerea richardsoni (Bonaparte). RICHARDSON'S OWL, (female).—Taken at Plattsburg, N. Y., Dec. 16, 1922, by Lieut. L. R. Wolfe, and presented to the State Museum. According to a note attached to the specimen, the stomach contained the remains of three deer mice. —S. C. BISHOP, *State Museum, Albany, N. Y.*

Notes from St. Lawrence Co., N. Y.—On September 30, 1922, near Canton, St. Lawrence Co., N. Y., I saw a male Arctic Three-toed Woodpecker (*Picoides arcticus*). The yellow crown patch and glossy black back were noted. The only other specimen I have recorded is a female, February 14, 1921, at Ithaca, N. Y.

On January 14, 1923, a Red-headed Woodpecker (*Melanerpes erythrocephalus*) flashed across a wood-bordered road. The wild scolding call was answered by six or eight other individuals of the same species wintering in this beech grove.

January 16, a flock of twelve Purple Finches (*Carpodacus p. purpureus*) were observed eating mountain-ash berries on the campus of St. Lawrence University, Canton, N. Y. There were no rosy plumaged birds in the flock. They have been seen continuously for about three weeks.

One of the most characteristic river birds of the Mohawk Valley in east central New York state in winter is the American Merganser (*Mergus americanus*). They frequent the open water all winter and a flock of 20 has been near Fort Plain, N. Y. since December 20, 1922.—DOUGLAS AYERS, Fort Plain, N. Y.

Notes from Sault Ste. Marie, Mich.—

Scotiaptes nebulosa nebulosa. GREAT GRAY OWL.—From Oct. 22 to Nov. 1, six of these Owls were shot in various parts of this, Chippewa County, and brought into town. Nov. 8, one was seen hanging up at a Hunting Camp in Luce County about 55 miles west of the Soo, and Nov. 17 another was shot and brought into town. The one shot Nov. 1 was obtained by M. K. Christofferson, my associate in bird work, and sent to Prof. W. B. Barrows of the Michigan Agricultural College. For ten years our only other records are, one killed in the fall of 1913 and another in the fall of 1916, both by hunters.

Nyctea nyctea. SNOWY OWL.—A few of these Owls are seen every year, earliest date for the last five years Oct. 6, 1918, latest date Apr. 23, 1921. This is the first year have ever seen or heard of one in summer. June 4 one was caught alive about 12 miles from town. The party capturing it fed it salt fish and it died the next day. Did not see it alive but saw the dead bird.

Hesperiphona vespertina vespertina. EVENING GROSBEEK.—Three males and five females arrived at my feeding station Nov. 16. This is the eighth consecutive season Evening Grosbeaks have come in to my feeding station. They usually come in in October and stay until the end of May, feeding daily. Usually a few come in first, later being joined by others until the flock numbers from 25 to 60. Food is plentiful this year which is probably the reason the birds were late in coming in. This year for the third consecutive year I have found these birds in summer. They occurred in several locations:

June 11—1 male six miles from Munising, Alger Co.

June 12—1 male at Chathan, Alger Co.

June 13—1 male Munising Junction, Alger Co.

July 15—a pair Hulbert, Chippewa Co.

July 15—2 males Soo Junction, Luce Co.

July 15—2 males, Munising Junction, Alger Co.

At all points given above additional birds were reported as present all summer.

August 4—1 male back of Goulais Bay, Ont., about 30 miles north of the Soo.

October 15—6 were seen at Eckerman, Chippewa Co.

While at a hunting camp, some fifty miles west of the Soo, Dr. Christoferson reported Evening Grosbeaks present almost every day, November 8 to 27. Largest number seen any one day twenty.—M. J. MAGEE, South Ste. Marie, Michigan.

Some Notes on Rare Michigan Birds.—

Thryomanes b. bewicki. BEWICK'S WREN.—BARTOWS (1912 Birds of Michigan) states that "this rare Wren has been taken at only three or four points in the state," all in the southern portion. Grand Rapids is the most northern record, where a pair built a nest in May, 1894, as recorded by Leon J. Cole. Bartows mentions one taken at Ann Arbor June 3, 1878. Since that date it had not been noted until May 23, 1920, when one was taken in the city by W. Koelz. In May, 1922, the writer noted a pair about a wren house in his garden. Later they nested there and raised a fine brood, none of which were disturbed.

Vermivora c. celata. ORANGE-CROWNED WARBLER.—BARTOWS (1912) states that this is "a decidedly rare bird." Since that date it has become more common or our observers more numerous, as we have many more records. However, our fall records are few, and October 3, 1906, is the latest date until in 1917 when one was taken near Ann Arbor, the 27th of November by Walter Koelz.

Pinicola canadensis leucura. PINE GROSBEEK.—BARTOWS (1912), says "this species is not known to nest in the state and the United States nesting records are few." A recent record of an immature female, taken August 15, 1921, near Ontonagon, Michigan, by Walter Koelz, shows a possibility of its having nested in that region as an adult female and three young were seen together by Mr. Koelz. This specimen (No. 54151, Museum of Zoology) is a bird of the year in post-juvenile plumage and probably had not wandered far from its nesting site.

Otocoris a. alpestris. HORNED LARK.—This species has been taken in various parts of the state and is, no doubt, a regular migrant along the shores of the Great Lakes, but neither Mr. Swales nor the writer had any records for southeast Michigan until 1922, when one was taken in Washtenaw County from a small flock on October 16, by Walter Koelz, who kindly donated it to the Museum of Zoology.

Otocoris a. hoyti HOYT'S HORNED LARK.—BARTOWS (1912), records three specimens for Michigan, one taken at Grand Rapids and two in Montmorency County in 1908. I take pleasure in recording a fourth

(the first from Washtenaw County) taken November 19, 1922, from a small flock by Walter Koelz, who donated it to the Museum of Zoology.

Perisoreus c. canadensis. CANADA JAY.—Barrows (1912), records the young of this species, but says there are no nesting records for the state. Mr. Walter Koelz took an immature bird September 1919 in Pickford Township, Chippewa County, and saw others. He was told by a resident that the species nested there.

Scotiaplex c. cinerea. GREAT GRAY OWL.—Barrows (1912) records a few taken in the Upper Peninsula, but only one for the Lower Peninsula. I wish to add a record for Elk Rapids, taken in 1893, and a fine male, sent me in the flesh by W. B. Purdy, taken at Hillman, Montmorency County, November 25, 1922.—NORMAN A. WOOD, Ann Arbor, Mich.

Some 1922 Records of Birds of the Madison, Wisconsin, Territory.

1. *Colymbus holboelli*. HOLBOELL'S GREBE.—One specimen observed April 28.

2. *Sterna caspia*. CASPIAN TERN.—Two individual observed May 17.

3. *Sterna paradisaea*. ARCTIC TERN.—Two birds closely studied while sitting, May 15.

4. *Chauleasmus streperus*. GADWALL.—Four specimens seen October 19.

5. *Aix sponsa*. WOOD DUCK.—One specimen, May 5.

6. *Limosa fedoa*. MARBLED GODWIT.—One bird, that allowed my close approach, seen May 18.

7. *Bartramia longicauda*. UPLAND PLOVER.—One bird, July 30.

8. *Falco peregrinus anatum*. DUCK HAWK.—One specimen May 12, another June 11.

9. *Falco columbarius columbarius*. PIGEON HAWK.—One bird May 7. These hawks are rarer with us than one might expect.

10. *Calcarius pictus*. SMITH'S LONGSPUR.—A single bird associated with Laplands, on the Sauk prairies April 17. Mr. H. L. Stoddard has seen a few others on this same favored locality.

11. *Passerherbulus lecontei*. LECONTE'S SPARROW.—One specimen collected October 9.

12. *Passerherbulus nelsoni nelsoni*. NELSON'S SPARROW.—Our search in the Madison region for this rare finch during the past eight years was first rewarded by a single specimen collected by William Schorger in 1921 and reported in 'The Auk' for October, 1922. On September 30, I collected three individuals from a flock of a dozen or so on the Hammersley marsh near Madison. The birds remained on the marsh for at least four days.

13. *Chondestes grammacus grammacus*. LARK SPARROW.—Several observed in the northern part of Dane county in which Madison is situated.

14. *Spizella pallida*. CLAY-COLORED SPARROW.—One specimen collected October 2.

15. *Bombycilla garrula*. BOHEMIAN WAXWING.—These birds were relatively common with us during the winter of 1921-22.

16. *Vireo belli belli*. BELL'S VIREO.—The nesting record was reported in 'The Auk' for October, 1922.

17. *Vermivora pinus*. BLUE-WINGED WARBLER.—An individual seen May 12.

18. *Vermivora celata celata*. ORANGE-CROWNED WARBLER.—One specimen collected on October 16, to establish identity. Half a dozen of these Warblers had frequented a five acre patch of twenty foot willows which formed a tangle along the edge of the Yahara River from October 9, at least, when they were first observed. I did not see them after the 16th. The only other Warblers in the thicket were a few Myrtles and one or two Maryland Yellow-throats.

19. *Dendroica cerulea*. CERULEAN WARBLER.—Several nesting birds heard singing in Baxter's Hollow on June 15.

20. *Seiurus noveboracensis notabilis*. GRINNELL'S WATER-THRUSH.—Typical specimen collected May 4.

21. *Oporornis agilis*. CONNECTICUT WARBLER.—Two individuals seen May 27, another on September 17, all three along the river bottoms of the Wisconsin River.

22. *Thryomanes bewicki bewicki*. BEWICK'S WREN.—The finding of the nest of this bird was reported by me in 'The Auk' for October, 1922. I observed one other specimen besides the nesting pair.

23. *Baeolophus bicolor*. TUFTED TITMOUSE.—One bird seen on December 26. It may well be that this bird is extending its range. One or two other records have been reported from the state during the present winter.—WARNER TAYLOR, 219 Clifford Court, Madison, Wisconsin.

Two Unusual Winter Records for the Chicago Area.—On December 17, 1922, a Brown Thrasher (*Toxostoma rufum*) was seen by Mr. Benjamin T. Gault and the writer in the DesPlaines River valley at River Forest, Illinois. This bird acted quite at home although the ground was covered with snow and the river under several inches of ice.

Then on January 21, 1923, Mr. Gault, Mr. W. D. Richardson and the writer observed six Myrtle Warblers (*Dendroica coronata*) at Dune Park, Porter County, Indiana. One of these warblers was collected and was found to have been feeding upon the dry fruit of the poison sumac (*Rhus venenata*). This, I believe, is the first winter record for the Myrtle Warbler in this section, though of course they winter in the southern counties of the State. Spring migrants rarely reach us before the first of April.—CHRESWELL J. HUNT, Chicago, Illinois.

Red Squirrel Eating Young Hairy Woodpecker.—April 16, 1922, when in a thin wood I heard a female Hairy Woodpecker making a great fuss as they do when one invades the vicinity of their nest. As I neared the place I saw the nest hole about twenty feet up in an elm stub. About

ten feet away, sitting erect on a limb of another tree, was a red squirrel eating something that it held in its fore-paws. My 8-power binoculars showed this to be a naked baby bird, presumably a Hairy Woodpecker and not more than two or three days old. Many times before I have seen red squirrels near the nests of birds and the parents were making a great fuss and trying to drive them away but this is the only time that I have actually seen one eating a young bird.—VERDI BURTON, *Branchport, N. Y.*

Note on Bonaparte's Continuation of Wilson's Ornithology.—

—Having by chance found an advertising leaf of the Philadelphia publishers, Carey, Lea and Carey, bound in one of their publications of 1825, in which they announce as "Just Published" "The American Ornithology or Natural History of Birds inhabiting the United States not given by Wilson", it may be of interest to make some comment.

In this advertisement the publishers state that Volume I, now for sale, will be followed by Volume II to be "published in June, and the third and last volume early in the autumn." They go on to remark: "Of this splendid work a very limited number is printed, the greater part of which are already subscribed for." It will thus be seen that Bonaparte and his publishers had no expectation of issuing a fourth volume. Examination of the first three volumes shows that Volume I was printed in 1825, and Volume II, instead of being published in June of the same year, did not appear until 1828. Volume III was also published in 1828. The chief bibliographic interest in this work, however, centers in Volume IV, not originally contemplated by the author or publishers, and which was issued by Carey and Lea in 1833, after an interval of five years from the publication of Volume III. In his Preface to Volume I, page 6, second paragraph, Bonaparte implies that the third volume would complete the work, but there is no preface or other remark explaining the issuance of a fourth volume. However, in the preface of Volumes II and III which appeared simultaneously, it seems that he decided to thus issue in two volumes what he had originally intended to be published in one, on account of the large amount of material which had accumulated. This being the case, Volume IV probably represents what he had originally intended to be Volume III.

As is well known to librarians and collectors of books on birds, the fourth volume of Bonaparte's work is very hard to secure. Probably one-half of the sets of the first three volumes lack the fourth, in spite of the endeavors of the owners to secure that volume. There is little doubt, in my own mind, that the fact of the original subscribers having been given to understand that three volumes would complete the work, together with the long period of time between the dates of the third and fourth volumes, greatly reduced the number of subscribers for the additional volume. Whether the number of copies of the fourth volume was further reduced by some accident to the stock, such as fire or water or

other damage, we have no information. We do know, however, that the majority of copies of this volume now existing are much injured by unsightly stains and spots due to dampness, in this respect greatly exceeding such defects in the other volumes.—SAMUEL N. RHOADS. *Haddonfield, N. J.*

RECENT LITERATURE.

Todd and Carriker on the Birds of Santa Marta.¹—Ornithologists have known that for many years past Messrs. Todd and Carriker have been engaged upon an intensive study of the birds of the Santa Marta Region of northern Colombia. Mr. Carriker took up his residence in the district in 1911, and ever since has been diligently engaged in collecting specimens which have been secured by the Carnegie Museum of Pittsburgh and the Academy of Natural Sciences of Philadelphia, and in studying the habits and distribution of the species, while Mr. Todd at the Carnegie Museum has been identifying the material and working out the technical questions presented by the collections and by his colleague's field notes. While we understand that the report has been practically completed for some time it has only recently appeared from the press. It constitutes a very full account of the 514 species recorded from the Santa Marta region, with prefatory sketches of the geography, geology, and climate and an historical account of ornithological explorations in the area. There is also a list of the species described from the Santa Marta region and a detailed discussion of the faunal zones into which it may be divided. At the end of the volume is an elaborate bibliography in which every paper with the slightest mention of Santa Marta seems to have been included, and a few supplementary pages by Mr. Carriker, covering a trip made in the summer of 1920, to the valley region east and south of the Santa Marta range. A colored map, four views of the country, six excellent colored plates of birds from paintings by G. M. Sutton and nine text figures illustrate the volume. The writers have termed their work "complimentary" to Dr. Chapman's volume on 'The Distribution of Bird Life in Colombia' and such indeed it is, especially as that author, well aware of the present investigation, omitted the Santa Marta region entirely in his study. It must therefore be very gratifying to the authors of both works as well as to ornithologists at large, that this intensive study of a limited area carried on for ten years, confirms in every way the

¹ The Birds of the Santa Marta Region of Colombia: A Study in Altitudinal Distribution. By W. E. Clyde Todd, and M. A. Carriker, Jr. *Annals of the Carnegie Museum*. Vol. XIV. October, 1922. Publications of the Carnegie Museum. Serial No. III. pp. 3-611, pls. I-IX. [pages 1-2 contain a foreword by W. J. Holland] (Received January 23, 1923.)

conclusions as to the distribution and origin of the Colombian bird life arrived at by Dr. Chapman from a much more superficial study of a much larger area.

We learn from the account of the physical features of the region that the Santa Marta mountains—the Sierra Nevada—are much older than the Andes and appear to be a remnant of a great transverse mountain chain, of which the Venezuelan Andes are another part and which probably terminated out in the Carribaean Sea beyond the Leeward Islands. A study of the bird life shows that there is a marked relationship between the species of the Santa Marta region and of the Venezuelan Andes, while those of the former region show little relationship with the fauna of the much nearer chain of the Eastern Andes, which of course belongs to the more recent Andean system.

In discussing the development of the Subtropical Fauna which the authors derives from the Tropical, as does Dr. Chapman, they contend that there has been a wide lateral dispersal of species developed in this zone as more and more territory suited to their needs became available, so that at present we should not be surprised if we find in the immediately contiguous portion of the Tropical Zone no form from which the Subtropical species seems to have sprung. This theory explains a rather puzzling condition that often presents itself in studying the origin of these species.

Of the birds found in the Santa Marta region 337 are considered as belonging to the Tropical Zone; 75 to the Subtropical; 22 to the Temperate and 7 to the Paramo Zone. A number of new forms have been obtained by Mr. Carriker in the course of his field work, but most of these have been previously described elsewhere by Mr. Todd. The single new race described in the present volume is a Puff Bird, *Hypnelus ruficollis decolor*, (p. 228) from Rio Hacha.

In the treatment of the systematic list of species the authors have for the most part followed Dr. Chapman's method but have differed in several important particulars. The classification, unfortunately, we think, follows that set forth in Mr. Ridgway's 'Birds of North and Middle America,' instead of that of Brabourne and Chubb's 'Birds of South America,' which is the only modern list of the Neotropical avifauna and which was followed by Dr. Chapman. The immense convenience, for the student who must consult Chapman's work and the present volume, of having a uniform sequence would seem to outrank all other arguments. A more important point perhaps is the omission of the reference to the original place of publication in all species except those described from Santa Marta. This is so directly contrary to general custom that it is often confusing and very annoying, especially as we frequently wish to know the type locality of the form we are discussing and are compelled to look up some other work of reference before we can even find where we are to seek this information. With such punctilious exactness in the preparation of the bibliography one would certainly have expected this

reference in the synonymy. Then again it would have been of the greatest assistance to those interested in the work of Mr. Carriker and his predecessors to have had a map with their routes indicated. It is however ungracious to criticize so admirable a work and we find here what was lacking in Dr. Chapman's volume—mention of all species recorded from the region whether taken by Mr. Carriker or not, those which seem of rather doubtful authenticity as regards locality being printed in smaller type. The clearly defined area which the authors are considering and the length of time that they have devoted to the work makes this exhaustive treatment possible, which was not the case in Chapman's study.

Messrs. Todd and Carriker are to be congratulated upon having produced one of the most important works ever published on the neotropical avifauna and the most important intensive study of a limited neotropical area. Taken in conjunction with Dr. Chapman's volume we now have the complex and puzzling bird life of Colombia placed upon a sound basis so that we are able to understand it and conduct our future studies in an intelligent manner. The work is admirably printed and while the errata are not numerous they have been carefully collected by the authors and published in two lists, one in the work itself, the other on an inserted slip. —W. S.

Beebe's 'A Monograph of the Pheasants.'¹—The fourth and concluding volume of this splendid work was distributed shortly after the first of the year and in every way conforms to the high standard of the preceding parts. For those who delight in the author's vivid word pictures of the Malay jungle and the mountain heights of the Himalayas there is an abundance of entertaining writing, while the more serious ornithologist will find as heretofore full descriptions of the beautiful birds of which the work treats, in all their plumages, with accounts of their habits and habitats, and much regarding their breeding and life in captivity.

The genera covered in the present volume are the Golden Pheasants (*Chrysolophus*), the Bronze-tailed Peacock Pheasants (*Chalcurus*), the Peacock Pheasants (*Polyplectron*), the Ocellated Pheasants (*Rheinhardius*), the Argus Pheasants (*Argusianus*) and the Peafowl (*Pavo*). The first is found in China and eastern Tibet and Burma; the second restricted to the Malay Peninsula and Sumatra; the third covering a wide range from Burma and eastern India to Indo-China and the lowlands of the Malay

¹ A Monograph of the Pheasants by William Beebe | Curator of Birds in the New York Zoological Park; Fellow of the New York Zoological Society and Director of the Tropical Research Station in British Guiana; Fellow of the American Ornithologists' Union and of the New York Academy of Sciences; Member of the British Ornithologists' Union; | Corresponding Member of the Zoological Society of London, etc. | In Four Volumes | Volume IV, | published under the auspices of the New York Zoological Society by H. F. & G. Witherby, | 326 High Holborn, London, England | 1922, | pp. i-xv and 1-242. pls. LXIX-XC and XV [omitted from Vol. 1.], photogravures 61-87, maps XV-XX. Price \$62.50 per volume in subscription for the four volumes.

Peninsula, Sumatra and Borneo. The Ocelated Pheasants are restricted to Siam and part of the Malay region while the Argus group extends to Sumatra and Borneo and the Peafowl cover practically all of India, and range from Burma to the Malay States and Java.

The Golden and Lady Amhearst Pheasants, the two species of *Chrysolophus*, are the last of the subfamily Phasianinae, the others here treated being separated into two other subfamilies, the Argusianinae, comprising the Peacock Pheasants, and the Argus Pheasants, and the Pavoninae containing the Peafowl. These groups are differentiated largely by the method of molt, the Peacock Pheasants beginning the tail molt with the third pair of rectrices from the center and progressing inward and outward, while the Peafowl begin with the sixth pair from the center. Of course the wonderful ocellations also distinguish these groups from the other Pheasants.

Of the colored plates in this volume seven are by Lodge, three by Fuertes, two by Thorburn, four by Knight, and seven, representing immature plumages, feathers, etc., by Grönvold. As heretofore Knight's paintings from which the reproductions were made are apparently all oils while all of the others are water-colors, the reproduction of the oil paintings have however produced more satisfactory results than previously, though in our opinion Lodge's water-color portrait of the Green Peafowl is far more effective, especially for a work of this kind, than Knight's representation of the Indian species. Between the three water-color artists there is little to choose. Thorburn had perhaps the advantage in having been allotted the two species of Argus Pheasants and his plates are really exquisite. The 27 plates of photogravures, all but two by the author, contain some wonderfully beautiful pictures of scenery in this fascinating home-land of the Pheasants. The two by Mr. D. Seth-Smith showing the lateral and frontal courtship of the Peacock Pheasant in captivity are of great interest, and a word of praise must be said for the admirable paintings of the feathers of the Peafowl and Argus Pheasants by Grönvold showing the evolution of the ocelli. It is interesting too to note that one of the Argus feathers here figured, from the British Museum collection, is so different from those of either of the well known species that it was used as the basis of a description of a third form *Argusianus bipunctatus* described by T. W. Wood in 1871, but up to the present time no additional specimen has come to light nor any information concerning where the feather in question really came from. Many a species has been described from a single specimen but here is one from a single feather!

There is much information of interest concerning the early history of several of the best known species notably of the Peafowl, which is a sacred bird over most of India and is of course closely associated with legends and stories. Curiously enough Mr. Beebe was unable to find any definite origin for the popular superstition that the Peafowl brings bad luck, a belief prevalent through England and America, Germany and France, but not found at all in the Asiatic countries, the true home of the birds. The

only suggestion that he can make is of a legend that the seven deadly sins complained to the Creator that he had been unfair in lavishing beauty on the Peafowl, whereupon he said that he had already given them more ornamentation than they should have had, and plucked out the yellow eye from Envy, the red eye from Murder, the green eye from Jealousy and placed them all on the plumage of the Peafowl and the sins have been following the bird ever since in an effort to regain their eyes.

From the geneticists' standpoint the discussion of the Black-throated Golden Pheasant and the Black-shouldered Peafowl, apparent sports which crop out in normal broods of the species, is of interest, as also the discussion of crosses between the Golden and Amherst Pheasants.

The work however, must be read by those who desire to appreciate fully the varied information which it contains and lack of space prevents us from making further comment. It only remains for us to congratulate the author, artists and publishers and all others who have been connected with this monumental work upon having brought the undertaking to a successful completion and having produced what will stand for all time as one of the most notable of ornithological works.—W. S.

Phillips' 'Natural History of the Ducks.' Just as Beebe's 'Monograph of the Pheasants' is completed the first volume of another illustrated monograph appears—'A Natural History of the Ducks'¹ by Dr. John C. Phillips. This is a large quarto but not so large as the Pheasant volumes, measuring 9 by 12 ins. as against 12 by 16 ins. It is beautifully printed on heavy paper and illustrated by full page plates by Fuertes, seven being in color and nine in black and white. There is also a plate of the downy young by Allan Brooks, a color plate 'The Duck Marsh' from a painting by F. W. Benson and outline maps to show the distribution of the species. These latter we think would have been more effective if the areas had been cross-lined or dotted instead of being surrounded by heavy lines. The plates are excellent and most of the poses of the birds admirable, although the artist in this volume is dealing for the most part with species with which he is unfamiliar in life. The alternation of colored and plain plates is of course always disturbing and most persons naturally find it difficult to judge the latter on their merits when contrasted with the brilliant colored plates, so that there will doubtless be criticism on this point. The present volume, one of four, covers the Plectropterinae or Spur-wing Ducks; the Dendrocygninae or Tree Ducks; and four genera of the Anatinae or True Ducks; including twelve genera and twenty-nine species. The treatment of the first group follows Salvadori's scheme (Brit. Mus. Cat. of Birds, Vol. XXVII) except that the several races of the Spur-

¹A Natural History of the Ducks [By] John C. Phillips [Associate Curator of Birds in the Museum] of Comparative Zoology at Harvard College [with Plates in Color and in Black and White] from Drawings by [Frank W. Benson, Allan Brooks] and [Louis Agassiz Fuertes] Volume I [Plectropterinae, Dendrocygninae, Anatinae (in part)] [vignette] Boston and New York [Houghton Mifflin Company] The Riverside Press Cambridge [1922] pp. i-viii + 1-264, pll. 1-18, maps 1-27. Price \$50.00 per volume.

winged Goose there doubtfully maintained are united in one species while the genus *Aix* is transferred to the Anatinae and *Nettapus albipennis* Gould is united with *N. coromandelianus*.

The Tree Ducks of Salvadori's work are all recognized but some changes in nomenclature appear; *D. fulva* (name preoccupied) being *D. bicolor* and *D. guttata* (a manuscript name) becomes *D. guttulata*.

In the four genera of Anatinae; *Alopochen* is substituted for *Chenalopez* of Salvadori's work but that author is inadvertently followed in taking the specific name *aegyptiacus* from Brisson, whose specific names are not recognized as available in modern nomenclature. Under *Tadorna*, *T. tadorna* very properly takes the place of *T. cornuta*, and *T. ferruginea* of *T. rutila*, but otherwise the arrangement agrees with Salvadori's. The accounts of the species are very full and the matter conveniently arranged for ease of consultation. First comes the technical synonymy of original or important references only; then the vernacular names sometimes in as many as six or twelve languages. Following these is an adequate description of plumage of the adult, immature and downy young, the second a little ambiguous perhaps in view of the modern plumage nomenclature; then a discussion of the distribution of the species at great length covering all countries in which it occurs with references to authorities, a work that has involved much careful research. General Habits includes matter under the following headings some or all of which appear under each species: Haunts; Wariness; Daily Movements; Association; Flight; Voice; Diving; Perching; Food; Courtship and Nesting; Status of the Species (increasing or decreasing); Food Value; Hunt; Enemies; Damage; Behaviour in Captivity; Hybridization; History of Domestication.

The rather lengthy introduction is full of general information about Ducks presented under much the same headings as appear in the specific accounts. Here we find a brief discussion of the classification and relationship of the Ducks, a subject which the author very rightly says has but little right to a place in a work of this kind which is intended to deal with the life history of the species rather than the technicalities of the systematist. We can heartily endorse his stand on genera when he says: "Genera almost too numerous to mention have been suggested but the tendency now is to make almost all of the true surface feeding ducks congeneric" since the species are potentially fertile *inter se* and "present classification no matter what it is based on is largely a matter of convenience and subject to varying opinion." There is a full discussion of duck plumages and molts including the curious eclipse plumage peculiar to certain species of the group and an outline of migration of which the author states our knowledge is as yet very crude, with no understanding of the sense which keeps the bird oriented "lone wandering but not lost" as he quotes from Bryant. Dr. Philipps considers that in Ducks at least the question of sex, species and age must be taken into account in studying migration. The great difference in range of Ducks is emphasized by contrasting the

Laysan Teal occupying one small island with the Old Squaw which ranges over the entire holarctic region.

The extent of Duck shooting has been taken up in connection with legislation in recent years but many will be astonished at the figures presented in this work. In the State of Minnesota, for instance, in 1919, no less than 1,804,000 Ducks were killed and in 1920, 1,800,000. Dr. Phillips estimates that this meant eight or ten millions in the United States and while he admits that shortening the season and other restrictions have reduced this perhaps by half, in recent years, he considers that the increasing number of hunters licensed and the constant draining of marsh land have fully made up for this saving in further reducing the number of birds.

Dr. Phillips has produced a book of the greatest interest to sportsmen and bird students and one which will be our standard of reference for information of the Anatidae—or such as come under the head of Ducks, since the Geese and Swans are not to be considered. Its text is replete with solid information gleaned from personal knowledge and the vast scattered literature on this group of birds which has attracted the serious attention of mankind since the earliest historic time. Naturalists will look with interest for the succeeding volumes, the last of which is to contain a bibliography of the various publications which have been consulted.—W. S.

A Hand List of Japanese Birds.¹—This excellently printed work is issued in commemoration of the tenth anniversary of the founding of the Ornithological Society of Japan and has been prepared by four leading members of this organization, each being responsible for a definite section. Kuroda covers most of the water birds, the birds of prey and the gallinaceous birds; Matsudaira the Limicolae, Lari Alcae, and Columbæ; Takatsukasa, the "Picariæ" and Uchida the Passeres. This is a novel scheme and not without its advantages.

The entire work, with the exception of a few pages of introduction and a postscript, is in English, though a Japanese name for each species (in Roman characters) follows the Latin designation, with an English name below. The reference to the place of original publication and the type locality are given with often another synonym of importance, and the habitat, covering the Japanese islands together with Saghalin, Corea and Formosa. No less than 788 forms, including subspecies, are given.

In the non-passerine groups genera are lavishly used following the lead of Mathews and a few other extremists in this practice. In the Limicolae for instance, there are 50 genera for 65 species, and in the Laridæ, 19 for 34, so that most of the genera contain but a single species and the binomial name, as a name, becomes useless. The absurdity of this misuse of the genus is rapidly being forced upon the attention of ornithologists in

¹ A Hand-List of the Japanese Birds. By N. Kuroda, Viscount Y. Matsudaira, Prince N. Taka-Tsukasa and S. Uchida. 1922. The Ornithological Society of Japan, pp. 184-18-4-2.

general as is evidenced by the protest in the January 'Auk', and its very advocates will soon make its abandonment inevitable. This is however a criticism of a practice, not of the excellent list before us.

We notice that while several of the recently proposed nomenclatural changes are adopted others are rejected, as the continued use of *Merula* for the Thrushes allied to our Robin, while *Bucephala* is brought into use for the Bufflehead Duck, and *Marila*, dating from Reichenbach, is used for the Scaup.

All in all the authors have produced an admirable list of the birds of Japan which will be a most convenient work of reference for ornithologists of other countries as well.—W. S.

Mathews' 'The Birds of Australia.'¹—Two parts of Volume X have appeared since our last notice, practically completing the Sylviidae. The remaining families include, according to the author's 'List,' about 150 species, which at the present rate of progress, should be covered in about twelve more parts, so that the end of Mr. Mathews' monumental work is at last in sight and we learn from another source that the manuscript has been completed.

The plates of the Blue Wrens and their allies which make up a large part of the present issues form some of the most attractive illustrations of the series. The text continues on the same lines as in the earlier parts, containing lengthy discussions on nomenclature and the number and relationship of the subspecies. In the latter connection the author is often far from clear as to his intentions, while his descriptions are unfortunately meager. On page 69 appears "*Malurus melanotus musgravei* subsp. nov. (Described)," but whether it is intended as a new form or not we cannot determine, nor where it is "described," though certainly not here. *M. splendens perthi* (p. 73) is a new name for *pectoralis* Gould while *Hallornis leuconotus wongani* (p. 83) has no diagnosis except that it is the darkest race of the species and comes from the Wongan Hills. Other new forms are: *Rosina comata rogersiana* (p. 129) from Derby, apparently described here although the description is in quotation marks, as in the case of forms previously described elsewhere; *Stipiturus malachurus richmondi* (p. 145) Richmond River; *Sphenura longirostris mastersi* (p. 156) King George Sound; and *Diaphorella modestus obscurior* (p. 185) Broken Hills, New South Wales. Mr. Mathews quotes Gould as to the rarity of the peculiar lilac tint on the head of *Rosina coronata* which that author only recalls elsewhere in the Bower-birds (*Chlamydoderae*). Mathews adds that it also occurs in the Pink-eared Duck (*Malacorhynchus membranaceus*) and we might suggest that in the Pink-headed Duck (*Rhodonessa*) and in *Nyctiornis* almost the same tint is to be found.—W. S.

¹ The Birds of Australia by Gregory M. Mathews, London; H. F. & G. Witherby, 326 High Holborn, W. C. I. Vol. X Part 2. December 12, 1922 (pp. 57-136); Part 3, January 30, 1923 (pp. 137-208).

Mrs. Myers' 'Western Birds.'¹—Mrs. Harriet Williams Myers has prepared, under this title, and for the needs of the many amateur bird students of California and other western states, a book which describes the appearance, habits, etc., of some 200 species of our Pacific Coast birds, as well as a few from farther inland and some of the familiar eastern species. The preface and advertisement call them "song birds" but over a quarter of the volume treats of Cuckoos, Woodpeckers, Flycatchers and other species which do not come under that category. To be more exact the scope includes everything after the Owls in the order of the A. O. U. 'Check-List.' The information is presented in a clear, unassuming style and is based upon the author's personal experiences, covering many years of bird study and the most reliable books and reports dealing with the species under consideration.

As an officer of the California Audubon Society, Mrs. Myers is eminently fitted to know just what her readers desire and she seems to have made a most satisfactory selection from the published material at her disposal, while her personal observations are interesting and instructive. There are numerous half-tone illustrations from photographs by the author and others, of wild birds and nests, and a certain number of others from mounted specimens.

We regret that in a work designed as we are told, to be "so plain and simple that the most unscientific of readers may enjoy and become more familiar with our feathered wild life," it was thought necessary to drag in technical names, especially when they are so unfortunately jumbled as in the present instance. On the first page of the text the name of the order comes first, then the genus followed by the suborder, the species, the family and finally the subfamily, while for some reason the generic name in large letters is repeated before each species with the family name after it! For example "Genus Sayornis: Black Phoebe. Black Phoebe *Sayornis nigricans*. Family—Flycatchers." Matters are still worse when the wrong names are used as "*Bombycilla*: Rough-winged Swallow" and "*Phalaenoptilus*: Hummingbirds, Goatsuckers etc." It looks as if these headings had been added after the text had been prepared, by someone unfamiliar with the use of technical names. They fortunately do not affect the value of Mrs. Myers' book and the readers who will use it will probably—and rightly—not concern themselves with the technical names at all.—W. S.

Van Oort's 'Birds of the Netherlands.'—The last two parts of this important work consist wholly of plates. They cover mainly the

¹ Western Birds. By Harriet Williams Myers, Author of "The Birds' Convention," Vice-President of the "California Audubon Society" New York. The Macmillan Company, 1922. pp. 1-391. Price \$3.50.

² Ornithologia Neerlandica. De Vogels van Nederland. door Dr. E. D. Van Oort. (20 plates.) Martinus Nijhoff, 'sGravenhage. Aflevering 16 and 17, November 1922, Aflevering 18 and 19, December 20, 1922. (19 plates.)

Plovers, Sandpipers and other Limicolae illustrating as heretofore the seasonal plumages, including the downy young, of all species which breed in Holland. There are in addition plates of several of the Hawks, Gallinaceous birds and Rails. The plate of the Ruff shows admirably the large number of confusing plumages which this remarkable bird assumes, while those depicting the Black Cock and Ring-necked Pheasant are also interesting in showing seasonal and other variation.—W. S.

Hartley's 'The Importance of Bird Life.'¹—This volume covers a much wider field than one would suppose from the title. The value of birds to agriculture and the means taken for their protection are fully considered, but unlike most similar works it does not stop there but includes chapters on the value, history, etc., of domestic fowls and pigeons; accounts of birds that are trained to hunt, to sing, and to perform in other ways; the history of the plume industry, of guano, of game birds and game laws. There is thus a large amount of information to be found here which would have to be sought for in various special publications and would not be available to the general reader. We gather here data on the flight of Homing Pigeons and learn that their fastest flight is at the rate of ninety miles an hour and that this is also the fastest accurately recorded rate for flying ducks. We can also obtain information on the history of falconry and the principles of poultry raising and of breeding for egg laying hens, some of which have now reached the record of 200 eggs a year. A number of half-tones from photographs illustrate many of the chapters. Mr. Hartley's book will prove a valuable work of reference for those desiring information on many branches of bird study not contained in the usual popular ornithological works. So far as we can judge from a hasty perusal of the volume the information is accurate, although we cannot quite share the author's optimism on the absolute success of the war on the plume trade, especially in the case of England where the protectionists do not seem to be satisfied with the working of the plume law, nor can we become enthusiastic on the future of our wild game for the preservation of which, we fear, vast protected breeding grounds must be provided and the number of gunners reduced, unless we are to be contented with and successful in breeding game for stocking private shooting grounds.

In the account of the nature of feather coloring the author is not quite clear, as he seems to say in one paragraph that in blue and metallic feathers the colors are "chemically composed and may be extracted by means of reagents," while in the next he states that blue feathers owe their color to surface structure which if eradicated will bring out the basic color which was previously concealed. We think there has been some typographical error in the former sentence while in the latter, though mainly

¹ *The Importance of Bird Life. A Popular Account of its Economic Significance and Conservation.* By G. Inness Hartley. Illustrated. New York. The Century Co. 1922, pp. 1-316. Price \$2.00.

correct, the blue is not dependant on *surface* structure as can be learned from the article on 'Blue Feathers' in the present issue of 'The Auk'.

In the list of birds which have been exterminated the use of "America" instead of North America or the United States is somewhat misleading as some of the species said to be extinct "in America" are still plentiful in Middle or South America. The term is, as we know, often used synonymously with the United States but not in scientific works or in distributional discussion. In this connection too we might suggest that the Scarlet Ibis said to be "found in the Gulf States; now exterminated in America" had never more than one definite record for North America—three birds seen by Audubon flying overhead in Louisiana. The Roseate Spoonbill, moreover, we hope is not quite extinct, while we notice that the Dickcissel has been exterminated in some states under that name and in others as the Black-throated Bunting, thus figuring twice in the list of species on the road to extinction. These are however, but casual slips in compilation and do not affect the value of Mr. Hartley's excellent volume.—W. S.

White's 'Check-List of the Birds of New Hampshire.'—This is another of those convenient little pocket lists for the recording of observations of which quite a number are appearing today. The names, technical and vernacular, are printed on the outer edge of the left-hand page with several narrow blank pages inserted, the paper being wide ruled ledger with each species occupying one line. The total number of species is 292, eight of them being additions to Dr. Glover M. Allen's list, namely: *Gavia pacifica*, *Pelecanus occidentalis*, *Mareca penelope*, *Nyctanassa violacea*, *Numenius borealis*, *Sturnus vulgaris*, *Spiza americana* and *Stelgidopteryx serripennis*, for the inclusion of which references are given. The author very wisely is content with the nomenclature of the A. O. U. 'Check-List' and attempts no innovations; The simplicity of the arrangement should appeal to everyone who uses it, while the good quality of the paper insures permanency to the records. We note with interest the inclusion of the English Sparrow, but at the end of the list instead of in its proper place. The Sparrow as we have always contended is in exactly the same category as the Sterling and if one is included in our daily lists so should the other.—W. S.

Chisholm's 'Mateship with Birds.'²—Popular bird study is going on apace in Australia even though it may have been later in getting started

¹ Check-List of the Birds of New Hampshire (F. B. White, Concord, N. H., October 1922.) pp. 1-120.

² Mateship with Birds. By Alec H. Chisholm, Past President Queensland Gould League of Bird Lovers, Past President Queensland Naturalists' Club, State Hon. Secretary Royal Australian Ornithologists' Union, Co-Editor Queensland Naturalist, etc. With an Introduction C. J. Dennis ("The Sentimental Bloke,") Illustrated with Photographs from Life by the Author and Others. Whitcombe & Tombs Limited. 189 Little Collins Street, Melbourne. [Also London.]

than in the English speaking countries of the Northern Hemisphere, and this well written book is a delightful picture of the great outdoors adapted especially to bird lovers in that far away land.

Americans who delight in the writings of Burroughs or Bradford Torrey will enjoy making the acquaintance of the Australian birds under Mr. Chisholm's guidance. They will however be startled to find the first touches of spring coming in August instead of in February and March, which are the midsummer months; and to find Robins and Thrushes that are utterly different from the birds that we know by those names, along with Diamond-birds, Whip-birds, Honey-birds and others totally unknown in American ornithology. The wider circulation of books such as this will do more to spread a knowledge and interest in general ornithology and create a desire to know something about the birds of other countries than can be accomplished in any other way, therefore we urge all who desire to broaden their knowledge to read Mr. Chisholm's little volume. It will be of interest to American readers too to find that he refers to several American species in the course of his accounts, as the Bluebird, Bobolink, Hummingbird etc., and has references to several of our best known popular writers. How many Americans we wonder, can speak as intelligently of bird life or bird students in Australia! Interesting too is his account of the inauguration of Bird Day in the schools of South America "backed by a recommendation from the United States" and the subsequent development of interest in bird conservation among the Australian children.

The author is an expert in bird photography and the book is illustrated by numerous excellent half-tones from photographs.

There are five chapters on the "Pageant of Spring" and six biographical sketches of characteristic Australian birds. An introduction by C. J. Dennis includes some painful evidence that the cat question is as vital in Australia as in the United States and the writer says: "A book upon 'Mateship with Cats' would earn my hearty disapproval."

We strongly commend Mr. Chisholm's book to American bird lovers and after reading it, on their next visit to the museum, the exhibit of Australian birds, which meant almost nothing to them before, will take on a real interest.—W. S.

Bretscher on Bird Migration in Central Europe.¹—This important contribution to the study of bird migration is based upon an astonishing series of records covering arrival dates of many species for from twenty-five to thirty years or more. The period of the migration is divided into ten-day periods and the number of first arrival records which fall in each period, are given.

¹ Der Vögelzug in Mitteleuropa Mit 16 Karten und villen Tabellen. von K. Bretscher. Innsbruck. Druck der Wagner'schen Universitäts-Buchdruckerei. 1920, pp. 1-162.

The Swift, for instance, in the middle district of Switzerland, arrived between the 11th and 20th of April at 14 stations in various years, while between the 21st and 30th, there were 86 firsts reported and between the 1st and 10th of May, 80. In all Switzerland which is divided into nine districts there were available 262 records of arrival of this species covering a period of 57 years, 1860-1917.

The data is arranged in several chapters dealing respectively with the spring flight in Switzerland, Alsace and Lorraine, Brunswick, and Hungary, and the autumn flight in Switzerland. There are also chapters on plotting the migration curves and the relation of temperature to migration.

The Hungarian record is based upon the wonderful series of observations of the Hungarian Ornithological Society and comprises from 3000 to 14000 records of arrival for the various species. From these records plottings have been made, which are added to the report in a folder and which illustrate graphically the daily advance of the species, presenting much the appearance of a contour map. Curiously enough there is a rather remarkable variation in the detail of the several charts.

To those interested in methods of handling bird arrival records this report will prove of the greatest interest.—W. S.

Todd on New Finches and Tanagers from Tropical America.¹—

In the course of a critical study of the Finches and Tanagers in the collection of the Carnegie Museum the following apparently undescribed forms were found: *Poospiza pectoralis* (p. 89), Guanacos, Bolivia; *Arremon auranti-rostris strictocollaris* (p. 90) Rio Atrato, Colombia; *Sicalis luteiventris flavissima* (p. 90) Para, Brazil; *Sporophila americana dispar* (p. 90) Santarem, Brazil; *S. castaneiventris rostrata* (p. 91) Santarem; *Pitylus grossus saturatus* (p. 91) Guacimo, Costa Rica; *Tangara boliviana lateralis* (p. 91), Rio Tapajos, Brazil; *T. cayana fulvescens* (p. 92) Palmar, Boyaca, Colombia; *Thraupis palmarum atripennis* (p. 92) Guapiles, Costa Rica; *Piranga saira rosacea* (p. 92) Palmarito, Chiquitos, Bolivia; *Mitrospingus cassinii costaricensis* (p. 93) El Hogar, Costa Rica; *Chlorospingus canigularis conspicillatus* (p. 93) Bitaco Valley, Colombia.

Friedmann on the Weaving of the Red-bellied Weaver Bird.²—

This paper is based upon studies of the captive birds in the aviary of the New York Zoological Park. The birds instead of building the type of nest that they do in a wild state built a cup-shaped nest with arched canopy attached at each end to the sides of the cup leaving an opening at the front and back. Mr. Friedmann also describes the stitches used by the bird and the method of holding the straw with one foot against

¹ New Forms of Finches and Tanagers from Tropical America. By W. E. Clyde Todd. Proc. Biol. Soc. Washington, Vol. 35, pp. 89-94. July 12, 1922. pp. 89-93.

² The Weaving of the Red-bellied Weaver Bird in Captivity. By Herbert Friedmann. Zoologica. Vol. II, No. 16. New York Zoological Society, August 23, 1922, pp. 1-372.

the foundation. Color preference in this weaver was studied by placing equal numbers of straws of seven different colors in the cage with the result that red was found to be the favorite followed by orange and yellow. In the summary it is stated that the birds built normal nests after a lapse of two years but no statement of this sort occurs in the body of the text.

Very little seems to be known of the details of the weaving of Weaver Birds and Mr. Friedmann's paper is a welcome contribution to a neglected subject.—W. S.

Cherrie and Reichenberger on New South American Birds.¹—

This is the third report on the Roosevelt collection made by Mr. Cherrie in 1913 and 1916. The new forms are as follows: *Tangara cyaneicollis melanogaster* (p. 1) Utiarity, Matto Grosso, Brazil; *Eupsittula aurea major* (p. 3) Puerto Pinasco, Paraguay; *Manacus manacus subpurus* (p. 4) Tapirapoan, Matto Grosso, Brazil; *Nystalus maculatus pallidigula* (p. 6) Urucum, Matto Grosso, Brazil. Lists of specimens of allied races examined and tables of measurements are presented along with the descriptions, the paper being a model in this respect and a relief from the all too brief "preliminary diagnoses" so prevalent today.—W. S.

Dwight on a New Gull.²—An examination of a series of *Larus fuscus* from the Azores shows that they constitute a distinct race which Dr. Dwight described as *Larus fuscus atlantis* (p. 1). The suggestion is made that the birds recorded as *Larus cachinnans* from the Canaries and Madeira may have been this form, and that the latter really does not breed much west of the Black Sea region.—W. S.

Todd on South American Forms of Myiarchus.³—In this careful review with its key to the species and subspecies and its exhaustive synonymy Mr. Todd seems to have satisfactorily straightened out another puzzling group of the Tyrannidae.

Eleven species are recognized; *crinitus*, a migrant from North America, *tyrannulus* with 3 subspecies, *pelzelni*, *sordidus*, *phaeonotus*, *ferox* with 4 subspecies, *cephalotes*, *apicalis phaeocephalus*, *atriceps*, and *tuberculifer* with 3 subspecies, none of which are new.

In preparing these studies in the Tyrannidae, Mr. Todd is doing an excellent service in systematic ornithology.—W. S.

Extracts from the Diary of Otto Widmann.⁴—This little brochure consists of eight essays written in Mr. Widmann's clear and attractive

¹ Descriptions of Proposed New Birds from Brazil and Paraguay. By George K. Cherrie and (Mrs.) E. M. B. Reichenberger. American Museum Novitates. No. 58. Issued February 13, 1923, pp. 1-8 with a table.

² Description of a New Race of the Lesser Black-backed Gull, from the Azores. By Jonathan Dwight. American Museum Novitates. No. 44. Issued September 6, 1922, pp. 1-2.

³ The South American Forms of Myiarchus, Proc. Biol. Soc. Wash. Vol. 35, pp. 181-218. October 17, 1922.

⁴ Extracts from the Diary of Otto Widmann. Transactions of the Academy of Sciences of St. Louis. Vol. XXIV, No. 3. Issued December 1922, pp. 1-77.

style, setting forth his careful observations without ornamental embellishment. The first three treat of the Purple Martin, its nesting habits; the feeding of the young; and the roosting place near St. Louis, Mo. The latter is in a willow thicket along the Mississippi, the birds assembling at first on a sand bar, thus differing materially from the habit of the species as we know it at Cape May, N. J., where they roost in a grove of rather tall maples with no previous place of assemblage except on rooves of buildings or telegraph wires.

There is also an account of a Crow roost at St. Louis; a sketch of the winter bird life of that region as well as a review of the bird life of the Ozarks and of parts of Taney County, Mo.; and an account of the Chimney Swift.

In the Ozark paper attention is given to a much neglected species, the Bewick's Wren, which here, as in the mountain foot-hills of south central Pennsylvania, occupies the rough country to the exclusion of the House Wren.

Mr. Widmann's sketches are delightful reading and form a contribution of no little importance to the ornithology of Missouri.—W. S.

Figgins' 'Additional Notes on *Branta canadensis*.'¹—Mr. Figgins after a lapse of several years returns to the controversy with Mr. Harry S. Swarth on the status of *Branta canadensis hutchinsi* and *occidentalis* which he still contends are hybrids, while the forms *canadensis* and *minima* he thinks should be regarded as species. The old points of difference are gone over again at some length and some additional data presented, notably measurements of specimens from the Arctic Coast and Hudson Bay supplied by Dr. R. M. Anderson. Such questions are purely matters of personal opinion until adequate series of breeding birds are secured, a condition which does not, in the present case, seem to have been reached. Meanwhile the varied interpretations of older writers and the question of what measurements shall and shall not be used does not seem to get us nearer to a solution. Hybridism however, we might add is a very difficult thing to prove.—W. S.

Abbott's 'What Comes from What.'²—This little pamphlet consists of charts representing graphically the relationship between all groups of plants and animals from the lowest moulds and bacteria to the flowering plants, and from the infusoria to the vertebrates. They are of course mainly compiled and while ingenious, cannot be taken too seriously because individual opinion as to lines of descent differ so greatly.

¹ Additional Notes on the Status of the Subspecific Races of *Branta canadensis*. By J. D. Figgins. Proc. Colorado Museum of Natural History. Vol. IV, No. 3. December 15, 1922, pp. 1-19.

² What Comes from What, or the Relationships of Animals and Plants. By Charles L. Abbott. Published by the Author. 600 Ivy Street, St. Paul, Minn. pp. 1-48, Price \$1.00.

Few ornithologists, for instance, will admit that the Hummingbirds were evolved directly from the Swifts or that the latter came through the Tree Swifts from the Caprimulgidae. Nor can we say that the South American Tanagers arose directly from the Sturnidae of the Old World especially when our best authorities are unable to clearly differentiate them from the Fringillidae. Nevertheless the author has ingeniously contrived to place the various orders and families in such a way that their general relationship is indicated.—W. S.

THE ORNITHOLOGICAL JOURNALS.

Bird-Lore. XXV, No. 1. January-February, 1923.

Stories from Birdcraft Sanctuary. By Mabel Osgood Wright. III. The Winter Patrol.—Care of the reservation in winter and accounts of bird visitors.

Bird-Lore's Twenty-third Christmas Census. Edited by John T. Nichols.—The usual large list from all parts of the country which will be carefully studied by local students. We congratulate the editor upon his practice of inserting queries after records which appear to him doubtful and which are not accompanied by corroborative data. The carelessness that is becoming prevalent in publishing uncorroborated observations will ruin the whole value of sight records if not checked, and will compel us to throw them all out in preparing authentic State lists etc. Trained ornithologists are well aware of this fact and where they err in not insisting upon corroborative data they are all the more to blame, as they should be an example in this respect to the beginners. The observer who finds his most interesting observation queried or rejected will be very careful to furnish details next time.

Visitations of Siskins and the presence of wintering Towhees seem to have been the features of this winter in the Atlantic States.

In connection with Mr. Potter's list of 43 species from Cape May, N. J. it may be of interest to know that the Delaware Valley Ornithological Club on its annual hike on Washington's birthday saw 51 species in the same locality and failed to see 14 of those listed by Mr. Potter and no trace of spring migration was yet in evidence. So does winter bird life vary from day to day.

Mr. Pearson continues his account of the Herons of the United States and a plate by Fuentes depicts the Egret, Great White, Great Blue and Würdemann's Herons.

The Condor. XXIV, No. 6. November-December, 1922.

The development of Young Costa Hummingbirds. By R. S. Woods.—Illustrated.

Evidence of Musical "Taste" in the Brown Towhee. By Richard Hunt.—This is a long discussion of song development through mimicry. The author heard two Brown Towhees in far distant localities both adding

a musical phrase at the end of their usual song. This phrase appeared to be in the one case an attempt to mimic part of the House Wren's song and in the other a similar attempt at the chirp of the "Linnet" (*Carpodacus mexicanus frontalis*). The elaboration being at the same place in each instance, and of the same character, he argues that it shows a definite desire to improve the song of the species. His final conclusions are that: (1) the cause of bird song evolution is the bird's aliveness; (2) the method is of necessity mimicry; (3) the result is an improved song, the bird's pleasurable awareness of the fact and the self stimulation to still further improvement resulting in a more conscious or deliberate employment of the mimicry method through the exercise of musical taste.

Notes on the Yellow-billed Loon. By Alfred M. Bailey.—Observations in south-eastern Alaska.

Distribution of *Molothrus ater* in California with the description of a new race. By D. R. Dickey and A. J. Van Rossem.—Three forms recognized *M. a. obscurus* in southern California north to Death Valley, the Panamints etc. and west to San Diego; *M. a. artemisiae* in the east-central and northeastern sections north of the last, and *M. a. californicus* subsp. nov. (p. 208) the San Joaquin Valley north to Merced Co., and possibly to Sacramento Valley, type locality Buena Vista Lake, Kern Co., Cal.

The Condor. XXV, No. 1. January-February, 1923.

A Study of the Flight of Sea Gulls. By Robert C. Miller.—This is an excellent discussion of the flight of Gulls both flapping flight and soaring. While the author reviews pretty thoroughly the theories advanced to explain soaring flight he adheres to the simplest explanation, that of upward currents of air, as entirely sufficient to explain the flight of Gulls although he admits that birds, especially in the tropics, which soar at great heights may encounter different conditions from those met with nearer the surface of the ground, and suggests that while such birds seem to be soaring in the absence of any noticeable upward currents such currents may nevertheless be present and the wing of the soaring bird is so constructed as to take advantage of very slight air movements.

A National Bird Day. By Althea R. Sherman.—Reprinted from 'Iowa Conservation.'

Fifteen Arizona Verdin's Nests. By Florence Merriam Bailey.—A careful analysis of the character and construction of the nests of this species. An example of a kind of study that has been much neglected. Really good analyses of the nests of our commonest birds are hard to find.

Migrations of the Golden and Black-bellied Plovers in Alberta. By William Rowan.—Discusses also the molt and compares its progress with the progress of migration.

Thoughts on English names in the A. O. U. Check-List. By W. L. McAtee.—A common sense presentation of the question that has agitated a number of minds in recent years. Mr. McAtee points out that those who

have made suggestions usually have had different ideas as to what the use of the English names was to be. He truly states that with the multiplicity of English names in use in different parts of the country it is impossible to select any set that will reflect general popular usage. Moreover he points out that a full set of English names fashioned after the scientific names will be simply a duplicate and hence a waste of effort and of little or no use. He considers it foolish to coin English names for subspecies which have no popular names in actual fact, but does think it desirable to have a set of English names for the species, which can be used in popular handbooks and bulletins. The teaching of the English names of the 'Check-List' to school children might eventually bring them into fairly general use but in no other way do they exercise any appreciable influence upon usage.

Comments on Two Recent Numbers of Bent's 'Life Histories of North American Birds.' By G. Willett.—Comments on various species as they occur in Alaska.

The Wilson Bulletin. XXXIV, No. 4. December, 1922.

Short Notes on the Life Histories of Various Species of Birds. By Ira N. Gabrielson.—Killdeer, Mourning Dove, Downy Woodpecker, Wood Pewee, Bronzed Grackle, Yellow Warbler, Redstart and Robin. A welcome article as we have all too little data on the behavior of even the commoner species.

Breeding of the Goshawk. By J. A. Farley.—In Worcester Co., Mass. A Sketch of the Wilson Ornithological Club. By Thos. L. Hankinson.—The opening paper at the Chicago Meeting of the A. O. U. in October last, the success of which was largely due to the hearty cooperation of the Wilson Club.

List of Warblers of Clarendon Co., S. C.—By E. von S. Dingle.

Random Notes from Arkansas. By H. E. Wheeler.

The Oölogist. XXXIX, No. 11. November, 1922.

Notes on the Hungarian Partridge. By H. F. Price.—Descriptions of nests in Paulding Co., Ohio.

Short-billed Marsh Wrens. By H. M. Harrison.—Nesting at Salem, N. J.

The Oölogist. XXXIX, No. 12. December, 1922.

North American Migrants seen during a Winter in Porto Rico. By S. T. Danforth.

The Oölogist. XL, No. 1. January, 1923.

An Annotated List of Birds Observed in South Florida. By Logan I. Evans.—At Arcadia and vicinity.

Evidence of the Black-billed Cuckoo Robbing Other Birds' Nests and Some Scientific Facts Concerning the Coloration of Birds' Eggs. By J. Warren Jacobs.

Further Notes on the Birds of Goochland County, Va. By Robert W. Williams.

The Ibis. (IIth Series.) V, No. 1. January, 1923.

The Birds of Sind. By Claud B. Ticehurst. Part III.

Notes on a Small Collection of Birds from the Azores. By Robert C. Murphy.—Notes on 24 species, recording *Larus hyperboreus* from the islands for the first time, and identifying the breeding Shearwater positively as *Puffinus kuhlii borealis*.

Note on a Nesting Coucal (*Centropus*). By Einar Lönnberg.—With a plate showing the peculiar long white filaments at the ends of the pinfeathers.

A Review of the Genus *Oriolus*. By Col. R. Meinertzhagen.—Does not recognize the genus *Mimeta*, but considers that the center of dispersal of the Orioles was the Australasian Region to which the *Mimeta* group, probably the primitive type, is still confined. From it evolved on the one hand the Maroon Orioles in southeastern Asia and the Golden Orioles which have spread throughout Africa, temperate Asia and Europe. *O. hosii* connects *Mimeta* with the Maroon Orioles and *O. isabellae* and *albiloris* with the Golden group.

Investigations on the Trans-Atlantic Migratory Movements of a Sora Rail (*Porzana carolina*), etc. By Prof. C. J. Patten.—This is a lengthy paper and a remarkable piece of speculation. On merely the presence of the dead bird in spring at the Slyne-Head Light in Ireland, the author endeavors to show how it probably reached Ireland, by crossing the Atlantic from South America. As long as we are indulging in speculation could it not have crossed from Greenland or northern North America the previous autumn as have a number of other individuals and, escaping the light houses and collectors, have wintered in the south of Europe and have been finally killed as it was returning north?

The plumages of the species are discussed by analogy with those of *Crex crex*. This procedure, however, is not without risks since we know that two birds far more closely related, the Sharp-tailed and Seaside Sparrows differ very decidedly in their molts.

On Birds of the Lake of Geneva. By J. N. Kennedy.—A popular account of the avifauna with a list of the species, but not of subspecies, "owing," as the author says, "to the impossibility of determining these, in general, in the field."

Notes on the Birds of Guarico and Apure in Venezuela. By Jean Delacour.—With a colored plate of *Brotogetis jugularis apurensis*, described elsewhere by the author.

On Some Zosteropidae. By H. C. Robinson and H. Boden Kloss.—*Z. aureiventer media* (p. 152) from S. W. Sarawak is described as new.

The obituary notices include those of Henry J. Elwes, late president of the B. O. U.; J. L. Bonhote, formerly Secretary, and Percy Godman, the last surviving founder. Also John Henry Gurney and W. E. DeWinton.

Bulletin of the British Ornithologists' Club. CCLXXII. November 29, 1922.

Mr. W. L. Selater, Chairman of the Club, made his annual address.

Mr. David Bannerman proposed two new forms from Africa: *Hypochera chalybeata sharii* (p. 29) Ratu, French Equatorial Africa; and *Euprinodes rufigularis angolensis* (p. 30) Ndala Tando, N. Angola.

Count N. Gyldenstolpe proposed the following new African birds: *Passer griseus zedlitzii* (p. 32) Benguela Town, Angola; *Eremomela badiceps ituricus* (p. 33) Ituri Forest west of Irumu; *Apalis porphyrolaema vulcanorum* (p. 34); *Criniger chloronotus weileri* (p. 34) same locality; *Trochocercus nigromitratus intensus* (p. 35) Kartoushi, Semliki Valley; *Alseonax infulatus ruandae* (p. 36) Bufundi, British Ruanda; *A. i. ngomae* (p. 36) Ngoma, Lake Kivu; *Cryptolopha wilhelmi* (p. 37) Mt. Muhavuna, Birunga Volcanoes; *Nectarinia famosa vulcanorum* (p. 38) Mt. Sabinio, Birunga Volcanoes; *Sorella emini quasso* (p. 38) N. E. Kenia.

Mr. T. Iredale proposed the new genus *Mathewsiella* (p. 39) for *Craspedophora*, preoccupied.

Mr. J. D. LaTouche proposed some new Chinese birds as follows: *Cryptolopha burkii distincta* (p. 41) Mengtz, Yunnan; *C. b. cognita* (p. 42) Kuatun, N. W. Fokien; *Orthotomus sutorius inexpectatus* (p. 42); *Parus major altorum* (p. 43) and *Corvus corone yunnanensis* (p. 43) all from Mengtz Yunnan; *Picus canus yunnanensis* (44) and *Dryobates pygmaeus permixtus* (p. 44) from Milati, S. W. Yunnan.

Lord Rothschild described, *Empidonis semipartitus orleansi* (p. 45).

Bulletin of the British Ornithologists' Club. CCLXXIII. January 9, 1923.

Proceedings of the twelfth oölogical dinner which was devoted entirely to a discussion of the Cuckoo problem in which Mr. Edgar Chance replied to Mr. Stuart Baker's paper previously noticed, and the latter stated that he was convinced that Mr. Chance's Cuckoo, which he had photographed, and others to which he referred, did lay the eggs in the nest and did not carry them in the throat but still contended that some Cuckoos do carry their eggs in this manner.

Bulletin of the British Ornithologists' Club. CCLXXIV. January 9, 1923.

An exhibition of downy young of various species.

Mr. H. F. Witherby described *Cyanopica cyanus gili* (p. 74) Candeleda, Spain.

Mr. D. Bannerman proposed *Hirundo puella maxima* (p. 75) Kumbo, Cameroon Highlands.

Dr. Hartert described *Chlorophoneus nigrifrons conceptus* (p. 79) Lake Tanganyika; and with Dr. van Someren, *Diaphorophytia graueri silvae* (p. 78) west of Lake Albert Edward; Dr. van Someren proposed *Sigmodus scopifrons keniensis* (p. 80) Meru, N. E. Mt. Kenia. and Mr. J. D. La

Touche *Corvus coronoides mengtszensis* (p. 80) from Mengtaz; *Alcippe nipalensis schaefferi* (p. 81) Milati, Yunnan and *Emberiza cia styani* (p. 81) N. W. Szechuen.

British Birds. XVI, No. 7. December, 1922.

The Great and Arctic Skuas in the Shetlands. By Francis Pitt.—(continued in January.) Illustrated with a number of half-tones from photographs.

British Birds. XVI, No. 8. January, 1923.

Concerning the Greenshank. By John Walpole-Bond.—Nesting habits.

British Birds. XVI, No. 9. February, 1923.

Ornithological Notes from Norfolk for 1922. 29th Annual Report. By J. H. Gurney.—Mr. Gurney's last paper. A biographical sketch follows as well as one of Mr. H. J. Elwes.

Avicultural Magazine. XIII, No. 5 to No. 12. May, 1922, to December, 1922.

While the majority of papers in this journal deal with aviculture, there are several of general interest. Two continued accounts run through several numbers:

'About Birds in North America.' By F. E. Blaauw.—An account of a tour from Florida to New Orleans and across to southern California and then northward to Seattle. There are a number of misidentifications, Brewer's Blackbird being taken for the Cowbird and the Varied Thrush for a variety of the Robin.

Notes of a Bird-lover in Venezuela. By J. Delacour.

There is a good picture of the Kagu in the May issue, and in the August number, an account of the sale of Little Tobago with its introduced Birds of Paradise to Mr. A. Lubin of Newark, N. J., who is reported to be interested in preserving them.

The Emu. XXII, Part 3. January, 1923.

Two Australian Grass-Wrens, *Diaphorillas purnelli* and *D. whitei*. By A. J. Campbell.

The Nesting of the Australian Pelican (*Pelecanus conspicillatus*). By W. Macgillivray. An excellent account with many illustrations from photographs.

Notes on the Habits of the North Island Kiwi (*Apteryx mantelli*) by H. R. Haeusler.—Interesting observations on the habits of two birds kept in captivity. Their sense of sight and smell did not seem to aid them in finding food which appeared to be accomplished by means of the highly sensitive tip of the bill. The heavy feet were used in defence, the bird rearing up and kicking forwards. When frightened the bird "froze" and remained absolutely rigid. The author points out that as there has been in recent times no animal in New Zealand large enough to harm a

Kiwi this protective action must be a survival from a very remote time.

Bird Notes from Willis Island. By Capt. J. K. Davis.

Type Descriptions and the International Code. By A. J. and A. G. Campbell.—While the authors of this paper have, like many others, failed to grasp the meaning of the word "indication" as used in the International Code (i. e., a reference to a published description, an illustration or a citation of a name for which the one proposed is a substitute) they have nevertheless made an admirable plea for adequate descriptions of new forms. 'The Auk' has for years been scoring the lazy or careless authors who publish a description of one or two lines in order to establish their new name regardless of the trouble that they are making for anyone else who may be working in the same group and who cannot tell what they are talking about without seeing their type and frequently there is no indication as to where it may be found.

Acanthizae or Thornbills. By A. G. Campbell.

Interesting accounts of the Annual Meeting of the Royal Australasian Ornithologists' Union with Discussion on Collecting Permits and Means of Saving the Native Birds.

The Most Extensive Ornithological Tour ever Accomplished in Australia. By S. A. White.—From Adelaide to Darwin and back some 5,560 miles in three automobiles.

Birds of Lake Frome District, South Australia. By Neil J. Gilp.

The South Australian Ornithologist. VI, Part 6 to VII, Part 1. April 1922 to January 1923.

Mainly devoted to the proceedings of the Society and local notes. More general articles are:

A Trip to N. W. Australia. By A. M. Morgan.

Notes on Birds of Western Darling. By A. Cheyney (April).

Some Weights, Measurements and Temperatures of Birds. By A. M. Morgan. (October.)

An enumeration of Birds between Port Augusta and Claire. By J. B. Cleland. (January.)—This is a count of individuals and shows 49 native species (948 individuals) as against 3 introduced species (1238 individuals), Sparrow, Starling and Goldfinch.

The Austral Avian Record. V, No. 2-3. February 21, 1923.

Additions to my Lists of the Birds of Australia. By G. M. Mathews.—The author informs us that he has now completed the manuscript of 'The Birds of Australia' and thinks it desirable that the number of new forms therein proposed should be published at once and these form the body of the present paper.

More Notes of Interest. By G. M. Mathews and T. Iredale.—This consists of a discussion of the new names proposed by Pontoppidan, Scopoli and others, which may affect the present names of various European species. Incidentally it would appear that several names in the A. O. U. 'Check-List' must also be altered, viz: *Uria troile* must apparently become

U. aalge, *Larus argentatus* be changed to *L. varius*, *Sterna paradisaea* to *S. macrura* and *Tringa ferruginea* to *Erolia testacea*.

The priority of Boie over Fleming, which is established, will necessitate the substitution of *Melanitta* for *Oidemia*, and several changes in original references are pointed out.

On Type Designation of Avian Genera. By G. M. Mathews and T. Iredale.—A full discussion of this subject including suggestions of changes necessitated by the adoption of Selby's designations. Among these that of the "Blackbird" as the type of *Turdus* will make us revert to this name for our Robin after years of *Merula* and *Planesticus*!

Revue Francaise d'Ornithologie. Nos. 157 to 166, May 1922 to February 1923. [In French.]

Guide to the Birds of Africa. By Millet Horsin. (Cont'd.) (May.)

A Contribution to the Solution of the Problem of the Routes and Winter Home of the European Migrants. By A. Ferroouillat. (June.)

On the Resistance to Cold by Certain Exotic Birds. By Dr. Arnault. (June.)

Jean Crespon, 1797-1857. By A. Hugues.—With portrait. (July.)

A Study of a Collection of Hummingbirds from Mexico. By E. Simon and J. Berlioz. (July.)

Catalogue of the Birds of Canton Magnac-Laval. By Rene d'Abadie. (Aug.-Sept. to November.)

Passage of the Alps by Migrant Birds. By G. de Burg. (November.)

L'Oiseau, III, No. 4. April to December, 1922. [In French.]

Mainly devoted to cage birds but the following continued articles run through these numbers.

Experiences of a Naturalist in French West Africa. By Dr. Millet Horsin.

An Amateur Ornithologist in the American Tropics. By Jean Delacour.

Le Gerfaut. 1922, fasc. 1 and 2. [In French.]

An account of the Buzzard and a reprint of Baldwin's 'Marital Relations of the House Wren' (Fasc I). Followed in Fasc. 2 by statement of similar observations by M. G. deBurg published in 'L'Ornithologiste' 1913, Nos. 11 and 12.

Der Ornithologische Beobachter. XIX, Heft. 8 to XX, Heft 3. May to December, 1922. [In German and French.]

Ornithological Notes on the Region of the Bosphorus. By A. Mathey-Dupraz. (Cont'd.)

Fifth Report on Bird Ringing in Bern, for 1921. (May.)

Species and Subspecies of Swiss Titmice. By J. Troller. (November and December.) With description of *Parus atricapillus relictus* (p. 33) St. Moritz Dorf.

Other papers are local in character.

Ardea. X, Afl. I. June, 1921. [In Dutch.]

Ornithological Observations between Buenos-Ayres and Santiago.
By F. E. Blaauw.

The Swift. By A. E. H. Swaen.

On the Occurrence of *Rupicala crocea* in Surinam.

Ardea. X, Afl. II. June, 1922.

Some Remarkable Instincts and Habits in Birds. By A. F. P. Portielje.

A Noteworthy Book. Review of Otto Schnurre's "Die Vogel deutschen Kulturlandschaft."

Yearbook of the Netherlands Ornithological Club. No. 12.

Afl. 1 to 3-4. [In Dutch.]

Notes on the Eggs of Ducks. By T. G. De Vries. (No. 1.)

The Peregrine and Its use in Falconry. By Van Eddem. (No. 1.)

On the Avifauna of the Province of Limburg. By P. C. Riotte.—The Birds of Prey. (Afl. 2.)

On a Collection of Bird Skins from East Atjeh. By F. J. Van Heurn.

Ornithologische Monatsberichte. XXX, No. 2. March-April, 1922. [In German.]

On the Food of the Swift (*Micropus apus*). By W. Burmeister.

New Birds from New Guinea. By E. Stresemann.—*Trichoglossus haematodus chlorogenys* (p. 35) Maeanderberg; *Ailuroedus melanotis guttaticollis* (p. 35) Hunsteinspitze.

Two New Ploceidae from Africa. By H. Granvik.—*Ploceus insignis ornatus* (p. 40) near Nairobi; *Otyphantes reichenowi nigrotemporalis* (p. 40) Elgon.

Among the short notes we find an earlier name for the Crossbill of the eastern United States in *Loxia pusilla* Gloger. (Vollst. Handbuch der Naturg Vögel Europas 1834, p. 356.)

Ornithologische Monatsberichte. XXX, No. 3. May-June, 1922.

New Forms of the Genus *Scytalopus*. By C. E. Hellmayr.—*S. atratus* (p. 54) Rio Negro, Colombia; *S. griseicollis fuscicauda* (p. 55) Paramo de Rosas, Venezuela; *S. latebricola caracae* (p. 56) Galipan, Venezuela; *S. l. meridanus* (p. 58) Andes of Merida, Venezuela.

Among the short notes is a claim of priority for *Erythrura* over *Carpodacus* and the following new forms: *Alseonax mutua stotzneri* (p. 63) Kwanhsien, W. China; *Brachypteryx nipalensis harterti* (p. 63) Omeischan, W. China, by H. Weigold and *Asio helvola hova* (p. 64) Madagascar, and *Oriolus traillii mellianus* (p. 64) Kwangtung. By E. Stresemann.

Ornithologische Monatsberichte. XXX, No. 4. July-August, 1922.

On the difference between the first year and adult plumages of *Tetrastes bonasia*. By Guido Schiebel.

On *Arborophila gingica*. By E. Stresemann.

In the short notes we find *Cinnyris mediocris usambaricus* subsp. nov. (p. 86), Usambara by H. Grote; also the identification of *Zosterops incerta* A. B. Meyer as *Vermivora rubricapilla* and the proposal of *Chinophilus alpestris dwighti* for *Otocoris a. pallida* Dwight preoccupied. By E. Stresemann.

Ornithologische Monatsberichte. XXX, No. 5. September-October, 1922.

On *Accipiter planes*. By E. Stresemann.—*A. p. manehi* subsp. nov. (p. 110), Illo-Ilo.

On the Synonymy of New Guinea Birds. By E. Stresemann.

Ornithologische Monatsberichte. XXX, No. 6. March-April, 1923.

Eastern Palaearctic Migrants in Kameroun. By H. Grote.

Journal für Ornithologie. Vol. 70. Heft 2-3. April-July, 1922. [In German.]

Additional Notes on the Ornithology of Saxony. By R. Heyder. (Cont'd.)

The Relationship between Bird-weight, Egg-weight, Number of Eggs in the Set and Incubation Period. By O. Heinroth.—A lengthy discussion with tables and charts of variation curves.

The Ornithology of Macedonia. By O. Fehrer.

My Ornithological Career. By Hans von Berlepsch.

On the Theory of Bird Migration. By H. Geyr von Schweppenburg.—With a reply by Friedrich von Lucanus.

Remarks on Some New African Forms. By H. Grote.—*Musophaga violacea savannicola* (p. 398) Buala; *Hypochera chalybeata camerunensis* (p. 398) Mbaiki, Cameroon; *Estrilda senegala zedlitzii* (p. 401) Magogoni am Ruvu; *Pytelia melba conradi* (p. 401) Ukerewe-Insel; *Steganura paradisea interjecta* (p. 402), Weg Nola, Cameroon; *Turdus libonyanus adamauae* (p. 404), Adamaua, Cameroon.

New Forms from the Papuan Country. By E. Stresemann.—Eight new subspecies from New Guinea and the Aru Islands Two races of the King Bird of Paradise, Mino, Parrots and a *Megapodius*.

Journal für Ornithologie. Vol. 70, Heft 4. October, 1922.

A Contribution to the Life History of *Colymbus arcticus*. By Otto Graf Zedlitz.

The Reich Song-cross (Nightingale × Canary). By H. Duncker.—An eleven year experiment in rearing Canaries which were exposed to Nightingale song either by the bird or on a phonograph. By the sixth generation the Nightingale song was firmly established in the song of the Canary, so that a "teacher" was no longer necessary.

Bird Observations in the Environs of Coronel, Chile. By R. Pafaler.—On 77 species.

Remarks on New African Forms. II. By H. Grote.—*Passer griseus kleinschmidti* (p. 483), Ngaundere; *Estrilda melpoda tschadensis* (p. 483), Andali, Adamaua; *Parus niger camerunensis* (p. 484), Tibati; *Elminia albicauda kivuensis* (p. 485), Kwidschwi Island, Kiwu Lake; *Pycnonotus barbatus escherichi* (p. 485), Kumbe, Cameron; *Saxicola torquata adamauae* (p. 486), North Cameroon.

Some Remarks on Kirke Swann's 'Synopsis of the Accipitres.'—The Indo-australian species. By E. Stresemann.

Journal für Ornithologie. Vol. 7, Heft 1. January, 1923.

The Oldest Saxon Record of Birds, 1564. By B. Hoffmann.

The Former and Present Status of the Great Bustard in the Provence of Leipsig. By R. Schlegel.

The Ornithology of the Sinai Peninsula. By O. leRoi.—A very full discussion with bibliography. (Continued.)

The Geographic Forms of *Turdus libonyanus* and *Turdus olivaceus*. By B. Rensch.—Thirteen of the former and sixteen of the latter are recognized of which *T. l. costae* (p. 99), Magogoni, German East Africa, and *T. l. niassae* (p. 100), Somba, Nyassaland are described as new.

The Beginning of Ornithological Collecting. By E. Stresemann.

An Attempt at a Classification of the Most Common Feather Pigments. By K. Gornitz.

Twenty-first Annual Report of the Rossitten Bird Study Station of the German Ornithological Society. By J. Thienemann.

A Newly Discovered Plate of the Extinct Giant Rail, *Leguatia gigantia* Schlegel. By E. Stresemann.

Proceedings of the Ornithological Society of Bavaria. XV-Heft 2. September, 1922. [In German.]

On the Bird Life of Northern France. By W. Sunkel.

Systematic Remarks on Some German Birds. By W. Gotz.

Geographic Variation in the Races of *Emberiza calandra*. By K. Gornitz.

Remarks and Corrections in the Nomenclature of Bavarian Birds. First Supplement. By A. Laubmann.

New Birds from the Papuan and Polynesian Archipelago. By O. Neumann.—Eleven subspecies.

An Historical Account of *Podoces panderi* Fischer. By E. Stresemann.

'Anzeiger' of the Ornithological Society of Bavaria. No. 6, June 25, 1922. [In German.]

Mrs. Reichenberger describes *Siptornis vulpina reiseri* (p. 43), Piahy. N. E. Brazil.

Dr. Hellmayr describes: *Basileuterus tristriatus bessereri* (p. 44), Silla de Caracas, Venezuela; *Diglossa albilatera federalis* (p. 45), same locality; *Chlorophonia frontalis minuscula* (p. 46), Cumana, Venezuela; *Crocomorphus flavus tectricialis* (p. 46), Boa Vista, N. E. Brazil.

Aquila. Vol. XXVIII. 1921. [In German and Hungarian.]
Bird Life of the Great Bog-land of Pancsova (Hungary). By Eugen Nagy.—Photographs show nests of the Common Tern on the water lily leaves.

The Tongue of *Plegadis falcinellus*. By E. Greschik.

Dates of Bird Migration in Hungary; An account of the loss of three of the White Egret colonies existing in Hungary, in 1918, which are now part of the territory of Yugoslavia and Austria, and the effort to preserve the remaining one through the financial assistance of the Dutch Society for Bird Protection.

There are many local notes.

Ornithological Articles in Other Journals.¹

Beck, Rollo H. Bird Collecting in Polynesia (Natural History, XXII, No. 6) and The Voyage of the 'France' (Ibid. XXIII, No. 1), a continuation of the same.

Barrett, Charles. Australia's Wonderful Wild Life. (Ibid. XXII, No. 6.)

Shufeldt, R. W. Wildfowl Lore. (American Forestry, January, 1923)—An account of the Ducks of North America.

Ritchie, James. The Grear Waxwing Invasion of 1921. (Scottish Naturalist, November–December, 1922) cont'd.

Ritchie, James. Biographical Sketch of William Evans (1851–1922) (Ibid.).

Wayne, Arthur T. Discovery of the Breeding Grounds of the White Ibis in South Carolina (Bull. of the Charleston Museum, XVII, No. 4, 1922).—An important discovery of a large breeding colony.

Grinnell, J. The Trend of Avian Population in California. (Science, December 15, 1922.)—A common sense discussion of the alleged decrease in bird life so widely spread today by conservation advocates and bird and game protective associations. Dr. Grinnell, judging by conditions in California, considers from an examination of the available reliable evidence that the number of species has not altered in 75 years but that a few species have decreased in number of individuals some almost to extinction. In certain areas where man's activities are most marked, vicinity of cities, etc., the number of species, and the number of individuals of many species, have decreased sometimes to as much as forty per cent but in other areas, as irrigated sections, the numbers of species and individuals have increased enormously, though a few species adapted to the primitive arid environment have disappeared when irrigation changed conditions.

Game birds and birds of prey seem to have generally decreased.

¹ Some of these journals are received in exchange, others are examined in the library of the Academy of Natural Sciences of Philadelphia. The editor is under obligations to Mr. J. A. G. Rehn for a list of ornithological articles contained in the accessions to the library from week to week.

Dr. Grinnell while he advocates stopping all killing of birds about parks, city suburbs and wild life preserves, thinks that legal protection with ninety per cent of our bird species is absolutely unnecessary and cites the case of Crows, Jays and Blackbirds, which are unprotected and yet hold their own with any of the protected species. He admits that he is sensitive because of the inveighing of certain well-meaning but uninformed people against the killing of birds for specimens. While we quite sympathize with Dr. Grinnell we are firmly convinced that whatever the "trend of avian population" the trend of avian legislation is against collecting and the popular backing is so strong that opposition seems almost futile. Dr. Grinnell perhaps knows that in certain eastern states the securing of a permit for collecting is impossible except for a representative of a large museum and only one representative at that!

Trischitta, Antonino. On the Birds Described by Rafinesque in his "Caratteri" (Atti Soc. Ital. Sci. Nat. Mus. Civ. Milan, October, 1922. LXI, Fasc. II.)—Three of Rafinesque's names are accepted *Silvia juncidis* for *S. cisticola* Temm.; *S. rhodogastra* for *S. conspicillata* Temm. and *S. turdella* for *S. leucopogon* Temm. [In Italian.]

Magnan, A. The Characteristics of Birds in Relation to their Mode of Flight. (Ann. Sci. Nat. Zool., V, pp. 125-334, October, 1922.)—A lengthy discussion of this interesting subject. The author considers soaring flight dependent upon ascending and transverse currents of air. He treats at length the structure and shape of the wings, tail, body, etc., and the several methods of flight and the application of these facts to aviation. [In French.]

Robinson, H. C. and Kloss, C. Boden. Birds from the One Fathom Bank Lighthouse, Straits of Malacca. (Jour. Federated Malay States Mus., X, No. 4. December, 1922.)

A List of Birds Collected on Pulau Rumpia, Sembilan Islands (Ibid.).

List of Birds Collected in Pulau Jarak, Straits of Malacca (Ibid.).

Three New Oriental Birds (Ibid.). *Otus luciae siamensis* (p. 261), Peninsular Siam; *Cyornis anak* (p. 261), Peninsular Siam and *Kittacincla malabarica interposita* (262), Daban S. Annam.

Robinson, H. C. and Kloss, C. Boden. The Birds of South-west and Peninsular Siam. (Jour. Nat. Hist. Soc. of Siam, V, No. 1, pp. 1-87. December 21, 1921.)—126 species obtained but notes on many others are included in the discussion.

Chisholm, A. H. Bird Seeking in Queensland. (Queensland Naturalist, III, Nos. 4 and 5.)—Historical Account of the Ornithologists who have studied the Australian birds.

Hermann, Adolph. On the Breast Skeleton and Spinal Column of Birds. (Zeitschrift für Anat. und Entwicklungsgeschichte, LXV, 4-6, pp. 328-481.) [In German.]

Roberts, Austin. Nomenclature of African Birds. (Annals of the Transvaal Museum, VIII, Part 4. October 30, 1922.)—This is one of the

most extreme of the proposals for genus splitting that has yet appeared. The whole list of South African birds is considered in a running text fairly bristling with new names, several appearing on nearly every page. Papers such as this will do more to check the mania for new genera than anything else as they demonstrate how impossible it is to inflict such a burden upon nomenclature.

The author, like most of the other advocates of the practice, fails entirely to grasp the point that we are trying to make our technical names perform two services (see p. 000).

Musselman, T. E. A History of the Birds of Illinois. (Jour. Ill. State Historical Society, April-July, 1921, pp. 1-73.)—Covers the early history of the country, the extinction of the Passenger Pigeon, a list of migration dates and an annotated list of species.

Publications on Bird Protection.

Bird Notes and News. X, No. 2, 3 and 4. 1922.—From this journal we learn that the serious destruction of sea birds from oil discharged from vessels is as bad as ever, and it is pointed out that even if oil is not discharged within the three mile limit it will drift in with the wind or tide. There is also a biographical sketch of Mr. W. Hudson and an account of the activities of the "watchers," who are employed each year to guard the rarest British birds, notably the Kite and the Chough, from collectors who would otherwise effect their total extermination.

Eighteenth Annual Report of the National Association of Audubon Societies. (Bird Lore, December, 1922.)—Interesting as usual with detailed reports of the field agents and of no less than 62 state or affiliated societies. A portrait of Louis Agassiz Fuertes forms a frontispiece.

Report of the Chief of Bureau of Biological Survey, U. S. Dept. Agriculture. Among the many activities of the Survey we note that over 100 million acres of ground has now been treated with poison and the extermination of the Prairie Dog and other rodents practically accomplished in these areas. Damage has been done to shell fish by Ducks in Massachusetts but investigation shows that the scallop was the only kind and that the White-winged Scoter is the culprit, injury by other species being negligible. Patrolling the beds by the fishermen, who are at no expense for their upkeep, is suggested. Activities in bird banding, distributional and economic work are described, while steps are being taken to settle the dispute over the Malheur Lake Reservation in Oregon which has been threatened with destruction.

Bulletin of the Massachusetts Audubon Society. VI, No. 9. List of members and account of activities also a paper by L. R. Talbot on birds observed on an Atlantic Liner, among others a Montana Junco, though no information is given as to how this remarkable identification was made. We find ourselves unable to distinguish skins of this Junco from allied forms at the distance indicated.

New Jersey Audubon Society Twelfth Annual Report. Reports of the society's ineffectual effort to the placing of the Bobolink on the protected list.

Game Laws for 1922. The usual full synopsis of Messrs. Lawyer and Earnshaw of the Biological Survey. Also as a separate publication the 'Directory of Organizations Concerned with Bird and Game Protection.'

Canadian Department of the Interior has published a number of pamphlets 'Birds of a Manitoba Garden' by N. Criddle; 'Protection of Bird Neighbours' by Hoyes Lloyd; and 'Canada's Feathered Friends'; 'Lessons in Bird Protection,' 'Bird Houses,' by P. A. Taverner.

Fins, Feathers and Fur. September, 1922. Contains a paper by J. R. Nannestad on Bird Life on Albert Lee Lake.

The Gull. June, 1922 to February, 1923. Contains many local notes by members of the Audubon Society of the Pacific, also articles by Dr. Casey A. Wood on bird observations in British Guiana, Bermuda and Barbados.

Florida Audubon Bulletin. March, 1922. Describes efforts to save the Bobwhite by posting grounds.

Arbor Day and Bird Day. Penna. Dept. of Public Instruction. October, 1922. Is a very attractive pamphlet with excellent illustrations.

Iowa Conservation. VI, No. 2 and 3. Contains much of interest to the bird and forest lover.

CORRESPONDENCE

"Generic Subdivision".—"The Genus Debased."

Editor of 'THE AUK.'

Dear Sir:—While disclaiming any desire for controversy, I would like to present my personal views concerning the matter discussed under the above separate headings in the January 'Auk.' I hesitate to enter the ring against so formidable an array of opponents, but I cannot rest easy until I have "had my say" on the subject. I promise that this will be my last word on the subject!

In the first place, I cannot concede that "it is admittedly impossible to formulate an exact definition of such an elusive concept as a genus"; on the other hand, I maintain that such definition is not only possible but that there need be no difficulty in understanding what a genus, scientifically characterized, really is. I say *scientifically* characterized, because a genus not thus characterized—based simply on the criterion of "convenience," for example—is not a genus in the true sense of the word.

As long ago as 1901, in the Preface to Part I 'Birds of North and Middle America,' I defined the requisites of a genus in terms which, since I have no reason to modify them now, are quoted below:—"Accepting evolution as an established fact . . . there are no "hard and fast lines," no gaps, or "missing links" in the chain of existing animal forms except as they are caused by the extinction of certain intermediate types; there-

fore, there can be no such group as a family or genus (nor any other for that matter) unless it is cut off from other groups by the existence of such a gap; because unless thus isolated it cannot be defined, and therefore has no existence in fact. These gaps being very unequally distributed, it necessarily follows that the groups thus formed are very unequal in value; sometimes alternate links in the chain may be missing; again, several in continuous sequence are gone, while occasionally a series of several or even numerous links may be intact. It thus happens that some family or generic groups seem very natural or homogeneous, because the range of generic or specific variation is not great and there is no near approach to the characters of another coördinate group, while others seem very artificial or heterogeneous because among the many generic or specific forms none seem to have dropped out, and therefore, however great the range of variation in structural details, no division into trenchant groups is practicable—not because extreme division would result, but simply because there can be no proper definition of groups which do not exist. In short, no group, whether of generic, family, or higher rank, can be valid unless it can be defined by characters which serve to distinguish it from every other.

In a group of wide geographic range it is of course necessary to have all its components in hand in order to determine its limits and the number and boundaries of its subdivisions, for what seem distinct families or genera within the limits of a fauna may, when all the forms of an entire continent or zoögeographic "region," or the world at large, are examined, be found to be connected by intermediate extralimital forms. Sometimes, however, this test proves exactly the reverse to be true.

It is, unfortunately, quite true that "in practice the genus is little more than an arbitrary grouping for convenience"; it is also true—unfortunately—that "its relative value to the family on the one hand and the species on the other is purely conventional, and is a matter of expediency and not a scientific fact." It is equally true, however, that belief in or practice of the fallacy that the concept of a genus is a matter of convenience only is directly responsible for this condition. Many ornithologists of the last and earlier generations considered superficial likeness or resemblance between two or more species as indicating congeneric relationship.¹ Even at the present time some authors merge *Nettion* with *Querquedula*, apparently placing them together on account of their small size alone, for they possess no other characters in common except those shared by the entire subfamily Anatinae. Such very different Hawks as *Odontriorchis* and *Chondrohierax* are even now not unfrequently put in the same genus—why, it is difficult to understand. There are numerous other instances proving the inability of some recent or comparatively recent authors to appreciate or understand generic limits, among which the following may be cited; *Sarcoramphus* to include *Vultur* (formerly *Sarcoramphus*) and *Sarcor-*

¹ In many cases, however, why such resemblance was imagined is little less than a psychological puzzle.

amphus (formerly *Gypagus*); *Cathartes* to include, besides *Cathartes* proper, *Coragyps* and *Gymnogyps*; *Ibycter* to include *Phalacrocorax* and *Senex*; *Gallinula* to include *Ionornis*; *Mimus* to include *Dumetella*; *Guiraca* to include *Zamelodia*. Even worse associations have been made. For example, *Buteo solitarius*, which the original describer properly placed in *Buteo*, was referred to *Pandion* by Cassin, who also placed the species of *Parabuteo* in "*Craxirex*" (= *Buteo*). G. R. Gray referred to *Pandion* the genus *Polioptila* (belonging to an entirely different family) and also, following Cassin, referred *Buteo solitarius* to *Pandion*; his *Circus* included *Harpyhalia*, and his "*Nauclerus*" (= *Elanoides*) included *Chelictinia*, a form far more related to *Ictinia* but exceedingly distinct from either. *Podiceps major* (Boddaert)¹ is quite generally called *Aechmophorus major*, evidently because of its large size and long neck and bill, for it certainly is only distantly related to the type of *Aechmophorus*.

Superficial resemblances, or supposed resemblances, especially in coloration have been wrongly interpreted in another way also; Cassin, for example, placed *Buteo borealis* in four genera² (*Buteo*, *Leucopternis*, *Poecilopternis*, and *Tachytrichis*), and *B. swainsoni* in three (*Buteo*, *Leucopternis*, and *Poecilopternis*)!

Numerous additional cases could easily be cited, but the foregoing are enough to show that the idea of what constitutes a genus has often, even among authors of high rank, been an exceedingly "hazy" one; supposedly "important facts of likeness" having to their eyes completely obscured the points of radical difference, with a result wholly unscientific, an unsatisfactory except, perhaps, from the point of view of "convenience."

Beyond doubt, many of the current genera are, in their composition, really not natural genera at all, but more or less heterogeneous lots of species which resemble one another more or less, and constitute artificial groups which it is impossible to characterize by a diagnosis clearly distinguishing them from allied groups and at the same time applying to all the component species; because they each contain one or more species which no more fit the generic diagnosis than does a square plug fit a round hole. Such "genera" cannot be of any use (on the other hand are only obstacles to scientific progress and perversions of the truth) until some reviser ejects the misfits and places them where they belong, even if it be necessary to make more monotypic genera.

It is perfectly true that "the original genus of Linnæus was but little less than the family as recognized today," and "that the value [co-ordinate] of the genus has been consistently and progressively lowered [co-ordinately] since it was first established." This is as it should be, for the fact simply

¹ I do not know to what modern genus, if any, *P. major* should be referred; quite possibly it may be necessary to make one of those horrid monotypic genera specially for it.

² He called them subgenera, but three of the four are now recognized as genera, as two of them certainly are.

represents the progressive evolution of science. Evolution of the genus concept is directly the result of progressively increasing knowledge resulting from continual additions to the material studied; as it must be remembered that the forms of birds known to Linnæus and other earlier systematists were vastly fewer than those known at the present time, and that the earlier systematists knew nothing of the anatomy of birds.

If the number of monotypic genera is now much greater than formerly it is not the fault of the systematist, who expresses, or tries to express, the facts as he finds them. Nature has made these genera monotypic by extermination of connecting links, and nothing is to be gained by trying to force a species into a genus where it obviously does not belong; and I utterly fail to see that by weeding out these misfits "the advantage of the binomial system is thereby lost" or that "the generic name might almost as well be abandoned." Nor can I understand why it should be so inconvenient or obnoxious to anyone who, presumably, is searching for the truth to find that a species long included in a certain genus has been taken out of that genus and placed in one by itself. If "convenience" be the only, or principal, criterion, why not assort all the species of a family in lots of, say, five or ten, and call each one a genus? Such a plan would certainly simplify matters!

Personally, I regard genera containing a very large number of species as exceedingly inconvenient; nevertheless, I would not subdivide such a genus without good reason, even for the sake of convenience. Fortunately there are few such genera among birds.¹

As to subgenera, I believe that subgeneric names merely complicate nomenclature. Their use most certainly would not make the handling of names more easy. If trinomials, as applied to subspecies, are a "necessary evil," as I believe they are (even if used with discretion), subgeneric names are, in my opinion, an evil without compensating features. If we fully realize, and take for granted, that genera (as well as species, subspecies, and higher groups) are of very unequal value—as they must necessarily be—it seems to me that subgeneric names can easily be dispensed with as being both inconvenient and unnecessary.

ROBERT RIDGWAY.

Olney, Ill.

[While we agree with most of Mr. Ridgway's views we think he, like several other systematists, has missed the point in the wide-spread objection to generic division, viz: that our generic names serve two purposes (a) a tag by which to indicate what we are talking about, (b) an indication of the evolution of the group, and it is the sacrifice of the former in exploiting the latter that causes opposition. Furthermore it is just as important from the viewpoint of evolution, to indicate a common resemblance as a well defined difference, and every time we divide a group of species into two, on some differential character, we lose, in our name, all trace of

¹ Botanists, however, have to struggle with several such, as, for example, *Carex* and *Cratægus*, the species of which are so numerous that unless the names are arranged alphabetically it is almost impossible to deal with them.

several common characters which bind these two groups together as distinguished from other groups. Here again there are good grounds for protest. No objection can be made to taking a species out of a genus to which it has little or no affinity, but we gain nothing by dividing a genus into two genera which we still admit are closer to each other than to any third genus.

Moreover no two experts will agree on what characters or how many are necessary to separate a genus. We have evidence on all sides of this diversity of opinion, and it is not due to ignorance but to the weight that different authorities give to characters.

How our names may be maintained, with any value *as names*, and still reflect evolutionary relationship, expressing both resemblances and differences, is the problem, and subgenera have been suggested as the only expedient that seemed possible. The only other method would seem to be to abandon the use of scientific names entirely except for technical systematic work, a course which is already being forced upon us more and more as our Latin names become meaningless, to all but a comparatively few experts.—W. S.

A Plea for Caution in Use of Trinomials.

Editor of 'THE AUK:

Prior to the year 1872, the catalogue of North American birds consisted practically of binomials only; but during the early "seventies" there was great activity in the systematic study of our birds, resulting in two important publications, Dr. Coues' 'Key to North American Birds (1872),' his 'Check List' (1873), and Baird, Brewer, and Ridgway's 'History of North American Birds' (1874), and in these the nomenclature presented a very different aspect, a very large proportion of the forms being designated by trinomials.¹ The reduction of what had previously been considered species to the rank of subspecies, or "varieties" as they were then called, was carried to an extent unwarranted by the evidence; close resemblance to another form being considered, in many cases, as indicating specific identity of the two. The idea was a comparatively new one, quite fascinating at the time, and there was somewhat of a rivalry between Dr. Coues and the other authors as to who should spring the first surprise in that line.² Afterward, however, when much additional material, from more numerous geographic areas, had accumulated and been carefully studied it was found that many forms must be reinstated as species, and so a healthy reaction took place.

Unfortunately there has been a somewhat recent recrudescence of the fad of reducing forms on what seems to be purely theoretical grounds, the

¹Not however, the simple trinomial of present-day usage, but with the term "var." interposed between the specific and subspecific names.

²It should be explained that while there was a difference of two years in the publications of the 'Key to North American Birds' and the 'History of North American Birds,' the authors were actually working contemporaneously.

modern professors of the cult being even worse offenders than the original culprits, for with them assumed evidence of the common origin of two or more forms is considered as proof of specific identity even in the absence of present day intergradation. If this practice were applied to our North American check list the number of trinomials would be vastly increased.

I am very sorry indeed for this backward step in ornithological science, for I feel sure that instead of being an advance, it is a distinct retrogression. Trinomials are admittedly a *necessary* evil, but why impose them on an already sufficiently troublesome nomenclature when they are not only *not* necessary but doubtfully justified by the facts? We are dealing with forms as they are *today*, not as they may have been ages ago; and for one I can never agree to the naming of any of the Palearctic forms of *Penthestes* as subspecies of *P. atricapillus*; *Regulus satrapa* as a subspecies of *R. regulus*; *Falco regulus* as a subspecies of *F. columbarius*; *Astur atricapillus* as a subspecies of *A. gentilis*, or *Circus hudsonius* as a subspecies of *C. cyaneus*. Although I may have once held that view of their relationships that was many years ago. Now, I believe that trinomials should be used with caution, in short only when present day intergradation is clearly proven.

ROBERT RIDGWAY.

Olney, Ill.

NOTES AND NEWS

WALTER BRADFORD BARROWS, a Fellow of the American Ornithologists' Union elected at its first meeting in 1883, died in East Lansing, Mich., February 26, 1923. He had recently passed his 68th birthday having been born January 10, 1855, at Wellesley Hills, Mass. Professor Barrows graduated from the Massachusetts Institute of Technology in 1876, and from 1879 to 1881 was instructor in chemistry and physics in the Colegio Nacional at Concepcion del Uruguay, in Argentina. After his return to the United States he served as instructor in science in 1881 and 1882, at the State Normal School at Westfield, Mass., and during the next four years as instructor in biology, at Wesleyan University. On July 1, 1886, he was appointed first assistant ornithologist in the U. S. Dept. of Agriculture, in the Biological Survey, then known as the Division of Economic Ornithology and Mammalogy. He resigned on March 15, 1894, to accept the professorship of zoology and physiology in the Michigan Agricultural College at East Lansing, a position which he held until his death.

Professor Barrows was well known as an ornithologist. The results of his work in Argentina appeared in a series of papers on the 'Birds of the Lower Uruguay' in the 'Bulletin of the Nuttall Ornithological Club' for 1883, and in 'The Auk' for 1884. He also contributed a chapter on the 'Accipitres' to the volume on 'Birds' in the 'Standard Natural History, 1885. While connected with the Department of Agriculture his most notable publications were his bulletins on the 'English Sparrow' and the

'Common Crow.' In 1912 his magnum opus appeared under the title 'Bird Life of Michigan'—an excellent report accompanied by a voluminous bibliography. He was particularly interested in the distribution and life history of the birds of Michigan and especially in the local distribution and breeding habits of Kirtland's Warbler. Recently he became interested in bird banding and at the time of his death was making plans for active work in this field.

In accordance with a standing order of the Council, one of the Fellows, appointed by the President, will prepare a suitable memorial of Professor Barrows' life and work which will be presented at the next meeting of the Union.—T. S. P.

JUSTICE JOB BARNARD, an Associate of the American Ornithologists, Union since 1886, and a retired Associate Justice of the Supreme Court of the District of Columbia, died in his 79th year, at his home in Washington, D. C., February 28, 1923, after a brief illness following an attack of influenza. He was born at Maple Grove Farm in Porter Co., Ind., June 8, 1844, and received his education in the public schools of the County and in Valparaiso Male and Female College. During the civil war he saw service as a private in company K in the 73d Indiana Volunteer Infantry and was mustered out in 1865, with the rank of sergeant, notwithstanding the fact that he was in command of his company during the last year of the war after the commissioned officers had been taken prisoners.

After the close of the war, he took up the study of law, at the University of Michigan, and graduated with the class of 1867. In the following September, he married Miss Florence A. Putnam of Berrien Springs, Mich., and settled at Crown Point, Ind. Here he practiced law until 1873, and served as town clerk, marshal, assessor, and city treasurer. He then removed to Washington, D. C., his future home, and for a time was an associate clerk in the District Supreme Court. From 1876 to Oct. 1, 1899, he engaged in the practice of law and was then appointed by President McKinley an Associate Justice of the Supreme Court of the District of Columbia, an office which he filled until June 8, 1914, when he retired from the bench at the age of 70.

Judge Barnard was deeply interested in birds and wild life in general and was familiar with the common birds of the National Capital and with those about his summer home in Maine. He was one of the oldest Associates of the Union and attended the Washington meetings regularly and occasionally those held elsewhere. In 1906, he was elected president of the Audubon Society of the District of Columbia, and took an active part in its affairs until his death. Personally, he was very affable and public spirited and ready to assist in any way possible, a man of broad vision and wide interests, and a member of several educational and patriotic organizations. While he did not publish on birds he did much to encourage others and foster bird study and bird protection.—T. S. P.

WILLIAM BOWEN BOULTON, a life associate of the American Ornithologists' Union, died suddenly at Morristown, New Jersey, on September 17, 1922, in the 64th year of his age. He was born in Philadelphia, July 20, 1859, and married Miss Louisa Kuhl Kelly, October 13, 1881. There were six children, of whom four are now living; William B. Boulton, Jr., Howard Boulton, Mrs. John G. Bates, and Mrs. Newbold L. Herrick.

From early manhood, Mr. Boulton took a keen interest in all matters relating to the conservation of animal life and other natural resources of the nation. Although much of his time was devoted to successful organization and executive work touching on matters relating to fire insurance, banks, and trust business, he never lost an opportunity to render all possible assistance in bettering conditions relating to game birds and species of value to farm interests.

Mr. Boulton belonged to a number of shooting clubs, was president of the Flanders Club of Long Island for a long period, and was a member of the Game Commission of New Jersey for six years. He was presiding officer of the National Game Conference of the American Game Protection Association for six years which gave him an opportunity of being of the greatest service in guiding public sentiment toward the betterment of migratory-bird conditions.

His rulings as presiding officer were marked always by admirable judgment, by fairness and impartiality, and by a delicate tact in smoothing out differences of opinion, while his genial courtesy and patient readiness to listen to all sides of any question tended always toward peace and good feeling. This was the general opinion of all members, and the fact was naturally presented in a resolution at the last conference.

When waterfowl and other migratory birds came under the control of the Federal Government he was among the first of sportsmen to approve and fully endorse the regulations which were being criticized by some of the short-sighted and selfish as too drastic and unnecessary. He has published comparatively little relating to subjects nearest his heart, but his superior advocacy, his wide acquaintance, and his marked ability have rendered such valuable service that it is extremely difficult even to estimate at this moment the great good that has been accomplished in betterment of bird-life conditions. The passing of such a well-informed, enthusiastic, noble and helpful friend is a terrible misfortune and in his death American sportsmen and other bird men have suffered a loss which is too great adequately to express.—A. K. F.

APPROPRIATE exercises in commemoration of the centennial of the birth of Spencer Fullerton Baird, founder of the U. S. National Museum and the U. S. Fish Commission, were held in Washington, D. C., on February 3. In the morning a wreath was placed on Prof. Baird's tomb in Oak Hill Cemetery, by a special committee appointed for the purpose, at 3 P.M., a meeting was held at the National Museum when various suggestions for a Baird Memorial were considered, and at 8 P.M. a public

meeting was held in the auditorium of the Museum with addresses on the life and work of Baird. Dr. W. H. Dall spoke on 'Baird the Man,' Dr. C. G. Abbott, Ass't Secretary, on 'Baird and the Smithsonian Institution,' Prof. Edwin Linton on 'Baird at Woods Hole,' Dr. David Starr Jordan on 'Reminiscences of Baird,' and Dr. C. Hart Merriam on 'Baird the Naturalist.' The National Baird Memorial Committee recommended (1) that Baird's name be given to the laboratory of the Bureau of Fisheries at Woods Hole, Mass., (2) that a fund be established under the Smithsonian Institution for promotion of research and exploration in the fields in which Baird was especially interested, and (3) that a museum of fisheries and oceanography be established in Washington, D. C., by act of Congress. The Secretary of the A. O. U. who was appointed by the President as its representative, was present at all the meetings.

THE Department of Conservation of Massachusetts is seriously considering whether it is worth while to continue the preservation of the Heath Hen on Martha's Vineyard and Mr. Wm. C. Adams, director of the department, has solicited an expression of opinion.

Since the work was begun some \$47,000 has been expended by the State in maintaining the island as a reservation for the Heath Hen, but if it is purely a matter of expense, there are surely Conservation and Audubon Societies which would relieve the State of the comparatively small annual cost.

The extermination of any species is a dangerous thing, and even those who are so intent in "sowing the seed" of extermination of "vermin" may yet "reap the whirlwind." The saving of the Heath Hen is not a local or State matter but is of interest to the whole country and the scientific world.

The birds from a nucleus of 75 when protection started have at times increased to 2000, but in other years have decreased and at present only about 150 remain. Expert investigation should be made to ascertain the cause of this fluctuation and then steps could be taken for a permanent increase. At any rate we hope the State will continue rigid protection just now when it is sorely needed or allow someone else to do it.

THE annual meeting of the New England Bird Banding Association was held on January 17, 1923, at the Boston Society of Natural History. The president, Edward H. Forbush, was in the chair, and the meeting was largely attended.

The following officers were elected for 1923: Dr. Chas. W. Townsend, Boston, Mass., President; Dr. Winsor M. Tyler, Lexington, Mass., 1st Vice-Pres.; Prof. Alfred O. Gross, Brunswick, Me., 2nd Vice-Pres.; Laurence B. Fletcher, Brookline, Mass., Secretary; Mrs. Alice B. Harrington, Lincoln, Mass., Recording Secty.; Charles B. Floyd, Auburndale, Mass., Treasurer. Directors for two years: Francis H. Allen, West Roxbury, Mass., Ralph Lawson, Salem, Mass., Prof. F. A. Saunders, Cambridge, Mass.

An amendment to the constitution was adopted providing for 'Sustaining Members,' at \$5.00 and up, which will enable persons interested in bird banding to become members regardless of whether or not they actually band birds.

Following the business of the meeting the members were addressed by Mr. S. Prentiss Baldwin of Cleveland, Ohio, and Mr. F. C. Lincoln of the U. S. Biological Survey, both of whom talked briefly on their experiences in banding birds during the past year. A paper was read by Mrs. Elizabeth A. Herrick on her work in trapping birds on a second story roof with a trap constructed from an ordinary canary cage. Professor Alfred O. Gross, of Bowdoin College, gave a most interesting talk, illustrated with lantern slides, on his experiences with a family of Nighthawks and Mr. H. K. Job, of Connecticut, showed several reels of moving pictures made by him of the birds of the Magdalen Islands.—LAURENCE B. FLETCHER, *Secty.*

In the London 'Field' for Jan. 4, 1923, p. 29, H. F. Witherby states that "Readers of 'British Birds' have ringed 114,724 birds since 1909" when the scheme of marking birds was first started by that magazine.

On March 21, Dr. Alex. Wetmore, of the Biological Survey, sailed from San Francisco for Honolulu in charge of an expedition to the Hawaiian Bird Reservation. This expedition organized through cooperation of the Biological Survey and the Bishop Museum of Honolulu will visit several of the islands in the Reservation, including Laysan, and expects to return in about three months.

NATURELAND is a popular natural history quarterly published in Manchester, England, under the editorship of Mr. Graham Renshaw, well known as a former editor of the 'Avicultural Magazine.' Judging from the four issues for 1922, it should prove very attractive to those interested in outdoor life. The contents while varied contain many articles on birds both wild and in captivity. These are by no means confined to British species and we note articles on the birds of Cyprus, and on the nesting of the Secretary Bird in Pretoria. The plates are interesting and well printed.

THE Delaware Valley Ornithological Club held its 33rd annual meeting at the Academy of Natural Sciences, Philadelphia, on January 4, 1923. Officers elected for the ensuing year are President, James A. G. Rehn; Vice-President, Geo. H. Stuart, 3rd; Secretary, Julian K. Potter, and Treasurer, Saml. C. Palmer.

Sixteen meetings were held during 1922, with an average attendance of 24. Among the communications presented were: 'Bird Notes from Montana and Saskatchewan' by Geo. H. Stuart, 3rd; 'The Earliest Published Illustrations of Birds,' by S. N. Rhoads; 'Through the Kentucky Mountains with Camera and Binoculars' by Witmer Stone; 'Bird Adventures Down South' by Saml. Scoville, Jr.; 'Bird Life in Nicaragua' by J. Fletcher Street and 'Through the Ten Thousand Islands to Cape Sable,

Fla.' by C. J. Pennock. The Club took several successful hikes, about 20 men participating, and has organized a Bird Banding Committee with Wharton Huber as chairman. 'Cassinia' temporarily suspended will be resumed with a double number 1920-21 to appear in May, 1923, the regular 1922 issue to follow.

HARRY MALLEIS, field assistant of the Biological Survey, United States Department of Agriculture, left Washington, March 10, for the Lake Peten district and other points in Guatemala, with the plan to stop en route at Belize and at Turneffe Island, off the coast of British Honduras. The main object of the expedition is to procure a number of specimens of the Ocellated Turkey and the Curassow, with a view to attempting to acclimatize them on Sapalo Island, on the coast of Georgia, and to domesticate them. In addition to this work, scientific collections and observations will be made of the birds, mammals, reptiles, and batrachians.

THE Audubon Society of the Sewickley Valley, Pennsylvania, has issued an attractive little pamphlet under the title of 'The Cardinal' (No. 1, January, 1923), which it is hoped to issue semi-annually. This number contains a list of the birds of Sewickley by Bayard H. Christy. With the remarkable activity exhibited by the Audubon Societies of western Pennsylvania there should be no trouble in maintaining this excellent publication.

THE Baird Ornithological Club of Washington, D. C. held its Annual Meeting at the Cosmos Club on March 14, 1923. The incumbent officers were re-elected as follows: President, A. K. Fisher; Vice-President, Ned Hollister; Secretary, B. H. Swales.

A council was formed to consist of the officers and two additional members to which C. W. Richmond and T. S. Palmer were elected.

During the year the club held regular monthly meetings generally at the home of some one of the members. The meeting of February 20, 1923, was a memorial to celebrate the one-hundredth anniversary of the birth of Spencer Fullerton Baird with special reference to his career as an ornithologist. Doctors W. H. Dall, C. Hart Merriam and Leonhard Stejneger gave extremely interesting reminiscences of their relations with Prof. Baird and the latter's standing as a naturalist and administrator.—B. H. Swales, Secretary.

As is well known most of Gould's types of Australian birds are in the collection of the Academy of Natural Sciences of Philadelphia, having been purchased from Gould by Dr. Thomas B. Wilson, formerly president of the Academy, about the middle of the last century, and presented to the Academy along with the Rivoli and other collections secured by him about the same time. Some years ago Dr. Witmer Stone in conjunction with Mr. Gregory M. Mathews studied the Gould specimens critically and decided which of the several specimens representing most of the species, was the actual type, and a list of these was published in the 'Austral Avian Record.'

IN order to further facilitate the work of the Australian ornithologists, Mr. A. J. Campbell is sending to Philadelphia specimens of the forms that are considered to represent the Gouldian species and these are being compared with the types by Dr. Stone so that eventually there will be in Australia authentic specimens with which supposed new races may be compared. The handicap under which Australian ornithologists are compelled to work, with the type specimens of their birds mainly in America and England, can readily be appreciated and it is to be hoped that some similar arrangement may be made to secure for Australia authentic examples of the numerous forms described, often very briefly, by Mr. G. M. Mathews.